NEAH BAY NAVIGATION IMPROVEMENT STUDY

NEAH BAY, WASHINGTON

—

DRAFT DETAILED PROJECT REPORT

and

DRAFT ENVIRONMENTAL ASSESSMENT

NOVEMBER 1993

DEPARTMENT OF THE ARMY

NORTH PACIFIC DIVISION

SEATTLE DISTRICT, CORPS OF ENGINEERS

SEATTLE, WASHINGTON

THIS DOCUMENT CONTAINS:

Executive Summary
DRAFT DETAILED PROJECT REPORT
DRAFT ENVIRONMENTAL ASSESSMENT and FONSI

Project Plan and Cross-Sections - Plate 1
Foundation Exploration Test Hole Logs - Plate 2
Federal Project Real Estate Requirements - Plate 3
Borrow Area and Upland Disposal Site - Plate 4
Design and Construction Schedule - Plate 5

APPENDICES:

APPENDIX A,	Part 1	Section 404(b)(1) Evaluation
	Part 2	Public Notice
	Part 3	Comments/Responses to Public Notice
APPENDIX B,	Part 1 —	Coordination and Public Involvement
	Part 2	Coordination Letters
	Part 3	Fish and Wildlife Coordination Act Report and Corps Responses
	Part 4	Comments and Responses
APPENDIX C	Economic Analysis and Cost Sharing	
APPENDIX D	Analysis of Design and Estimates of Cost	

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release. Distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Seattle District Corps of Engineers 6b. OFFICE SYMBOL (If applicable) CENPS-EN-PL-PF	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) PO Box 3755, 4735 E. Marginal Way S. Seattle, WA 98124-2255	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION US Army Corps of Engineers Makah Indian Tribe 8b. OFFICE SYMBOL (If applicable) CENPS-EN-PL-PF	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code) PO Box 115 Neah Bay, WA	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO

11. TITLE (Include Security Classification)
Draft Detailed Project Report and Draft Environmental Assessment, Neah Bay Navigation Improvement Study, Neah Bay, Washington

12. PERSONAL AUTHOR(S)

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Draft Report	FROM _____ TO _____	November 1993	211

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Neah Bay, Strait of Juan de Fuca, Makah Indian Reservation, Federal navigation project, commercial fishing, small boat harbor navigation improvements

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Conducted under Section 107 of the 1960 River and Harbor Act, the Corps of Engineers study determined the feasibility of Federal involvement in constructing navigation improvements to service a proposed public commercial fishing marina at Neah Bay on the Strait of Juan de Fuca in northwestern Washington. The recommended plan includes 1) a Federal breakwater consisting of 1,450 feet of rubble mound and a 350-ft-long grounded bridge pontoon, 2) a Federal entrance channel authorized to 15 feet deep, 3) moorage facilities to service 200 commercial fishing boats, 4) non-Federal dredging and disposal of 50,000 cubic yards of material as pontoon ballast and beach nourishment, and 5) fish passage opening and removal of intertidal fill. Construction cost estimate (Oct 1996 prices) is $8,190,000 including Federal cost of $3,475,000 and $4,715,000 by the Makah Indian Tribe.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION
22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code) / 22c. OFFICE SYMBOL

EXECUTIVE SUMMARY

This study to determine the feasibility and Federal interest in development of a new public commercial fishing boat marina at Neah Bay, Washington, was conducted under the authority of Section 107 of the 1960 River and Harbor Act, as amended. Section 107 authorizes the Secretary of the Army to allocate funds for planning, design, construction, and maintenance of small navigation projects when, in the opinion of the Chief of Engineers, such work is advisable. The study was requested by the Makah Indian Tribe, which is the project local sponsor.

Neah Bay is located along the Strait of Juan de Fuca at the northwestern tip of the Olympic Peninsula about 150 miles west of Seattle, Washington. The bay borders the Makah Indian Reservation. Neah Bay is adjacent to prime fishing grounds in the Strait and Pacific Ocean for salmon, marine fish, and sea urchin but is often subject to severe winter wave conditions. The Indian and non-Indian commercial fishery is now a multi-species, year round activity. The nearest existing harbor with protected winter moorage is located at Port Angeles, 70 miles easterly. If winter wave protection at Neah Bay were available, fishermen could safely operate out of Neah Bay on a year round basis avoiding hours of additional travel time and costs traveling to and from the fishing grounds, the distant protected moorage, and the fish processor. A safe harbor would eliminate costly boat damages and sinkings. Small boat launching and retrieval costs could be reduced because winter fishermen could leave their boats in protected waters.

Detailed design and environmental investigations carried out in Neah Bay in the present and previous studies indicate that the public interest would best be served by navigation improvements to protect a new public marina located in the central portion of the south shore of Neah Bay.

The recommended plan includes the following:

- o Federal: 1,450-foot-long rubblemound breakwater offshore.

- o Federal: 350-foot-long grounded bridge pontoon breakwater on the nearshore.

- o Federal: Fish passage opening between breakwaters.

- o Federal: Entrance channel authorized to -15 feet Mean lower low water (MLLW).

- o Federal Mitigation: Sand blanket on pontoon rock base to reduce hiding places for juvenile salmon predators; removal of an intertidal fill (Evans Mole) as in-kind replacement of habitat covered by the pontoon breakwater. Monitoring of the beach.

o Federal: U.S. Coast Guard aids to navigation

o Non-Federal: Sixteen-acre Moorage Basin with a depth of -15 MLLW to accommodate 10-foot draft commercial fishing vessels at all tides; dredging and disposal of 50,000 cubic yards (c.y.) of material as follows: 14,000 c.y. for ballast inside pontoon; 6,000 c.y. for sand blanket on pontoon base; and 30,000 as beach nourishment.

o Non-Federal: Moorage facilities to serve 200 commercial fishing boats.

o Non-Federal Mitigation: Along with removal of Evans Mole, the cause of severe erosion to a beach adjacent to the project, dredged material consistent with the existing sandy substrate would be placed on the beach to hasten restoration of a normal beach profile and enhancement of clam habitat at the site. Marina staff would be trained on how to avoid adverse impacts.

The proposed breakwaters and marina would have no significant impacts to environmental features, including water quality, wetlands, wildlife, fishery resources, cultural resources, and endangered or threatened species.

Project first costs of the recommended plan total $7,651,000 (October 1993 prices) or $8,190,000 (full funded cost). Average annual Federal maintenance costs are estimated at $6,000 and non-Federal operation and maintenance at $69,000 annually.

The full funded cost share plan amounts are estimated as follows:

Federal Cost Share. At the time of construction, the Government would provide 90 percent of the $4,264,000 total cost of the general navigation facilities (GNF) or $3,838,000. The local sponsor would reimburse the government for 8.6 percent of the total cost of the GNF or $367,000 (10 percent of the total cost of the GNF less local sponsor credit of 1.4 percent for providing certain lands) either at the end of construction or over time with interest. The net Federal construction cost share would then be $3,471,000 plus $4,000 by USCG for navigation aids.

Non-Federal Cost Share for the GNF is estimated at $793,000, including 10 percent of the total cost of the GNF ($426,000 provided before construction) and 8.6 percent of the total cost of the GNF reimbursed to the Government or $367,000 (plus interest if paid back over time). Moorage basin dredging and construction of marina facilities, estimated at $3,864,000, would be 100 percent non-Federal.

Average annual costs over the 50-year project life including interest during construction and annual maintenance costs would be $739,000. Project benefit analysis computed transportation cost savings, reduced vessel and dock damages, reduced launching costs, and value of time saved. Average annual benefits would be $1,002,000, resulting in a benefit-to-cost ratio of 1.4 to 1.

DETAILED PROJECT REPORT

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

SECTION 4. THE RECOMMENDED PLAN

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

TABLES

TABLE OF CONTENTS (cont.)

SECTION 1. BACKGROUND

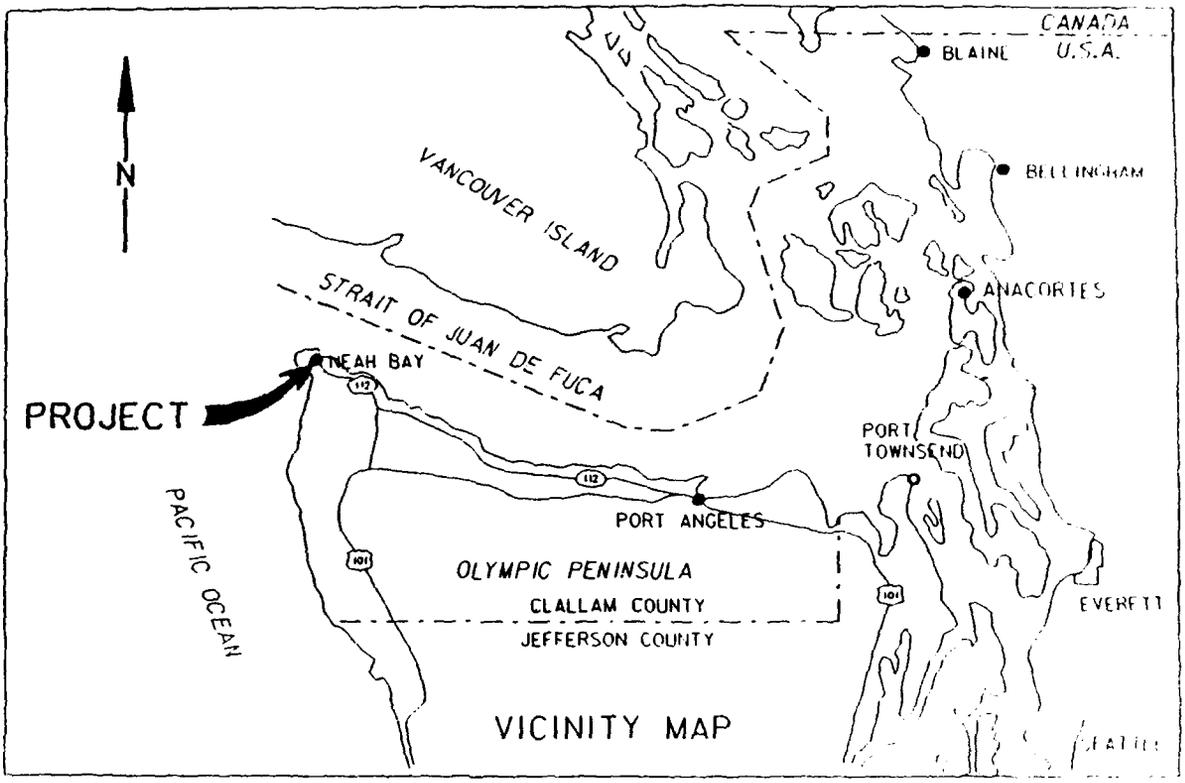
1.01 Study Authority. This report is submitted under authority of Section 107 of the 1960 River and Harbor Act, as amended by Section 915 of the Water Resources Development Act of 1986 (Public Law 99-662). Section 107 authorizes the Secretary of the Army to allocate funds for planning, design, construction and maintenance of small navigation projects when, in the opinion of the Chief of Engineers, such work is advisable. Not more than $4 million of Federal funds can be allocated under this authority for planning, design, and construction of any one project.

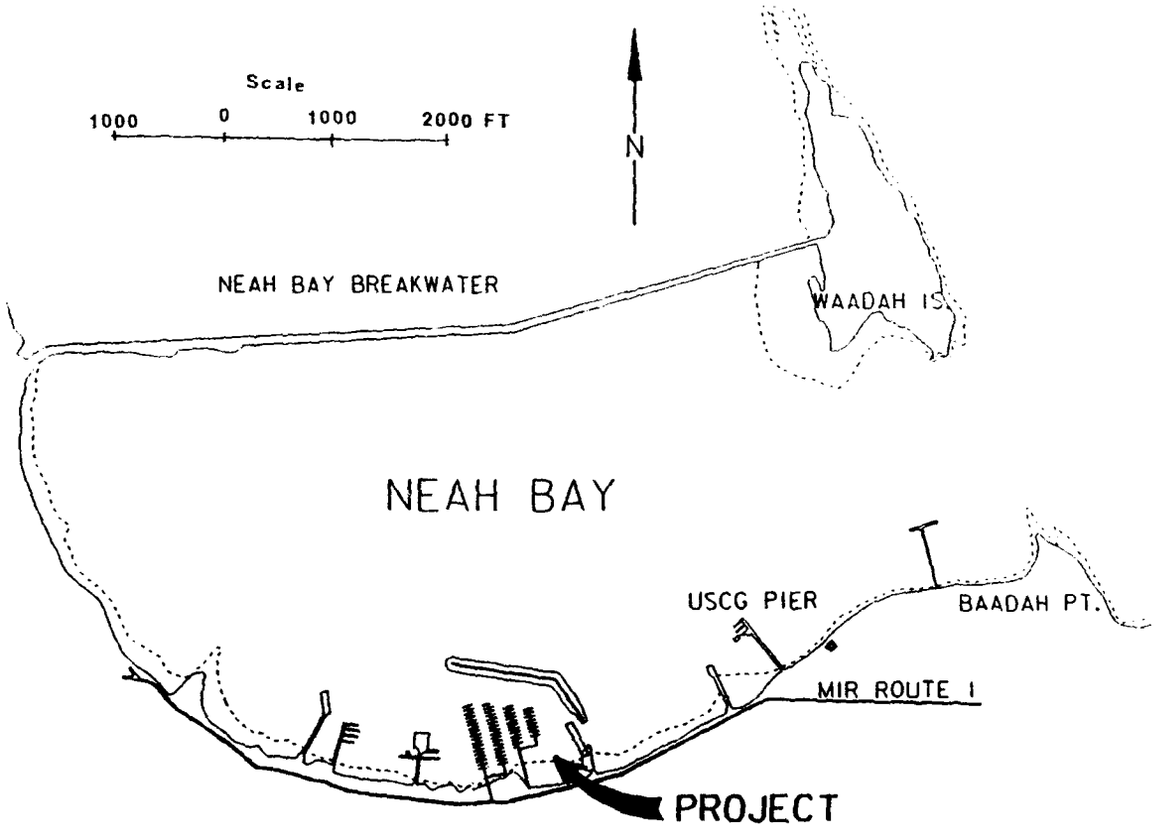
1.02 Type of Study. This detailed project report (DPR) presents the results of a feasibility study for constructing navigation improvements to service a proposed year round commercial fishing boat marina in Neah Bay, Washington. The study was undertaken by the Seattle District, Corps of Engineers, under the above authority in response to a request from the Makah Indian Tribe. The need for and desirability of undertaking a plan of improvement is presented. The accompanying environmental assessment (EA) addresses the environmental setting and effects of the proposed project.

1.03 Study Area. Neah Bay is located on the southern shore of the Strait of Juan de Fuca about 6 miles east of Cape Flattery at the northwestern extremity of Washington state (see figure 1-1). The bay shoreline is entirely within the Makah Indian Reservation. The tribal community of Neah Bay lies on the south shore and is 70 miles westerly of Port Angeles and 150 miles west northwesterly from Seattle. The Reservation consists of 23,000 acres at the northwestern end of Clallam County.

1.04 Existing Federal Project. Authorized by Congress in 1938, the existing Federal project at Neah Bay (see figure 1-2) consists of an 8,000-foot-long rubblemound breakwater completed in 1944 by the Corps of Engineers between Waadah Island and the westerly shore of Neah Bay, and reinforcement of a rock revetment extending approximately 2,200 feet west from Baadah Point and about an 800-foot-long extension of the revetment westward, completed in 1956. The breakwater was developed to provide a harbor of refuge and the rock revetment protects both the U.S. Coast Guard facilities and the Makah Tribe headquarters complex. The westerly 4,200 feet of the breakwater was repaired in 1980.

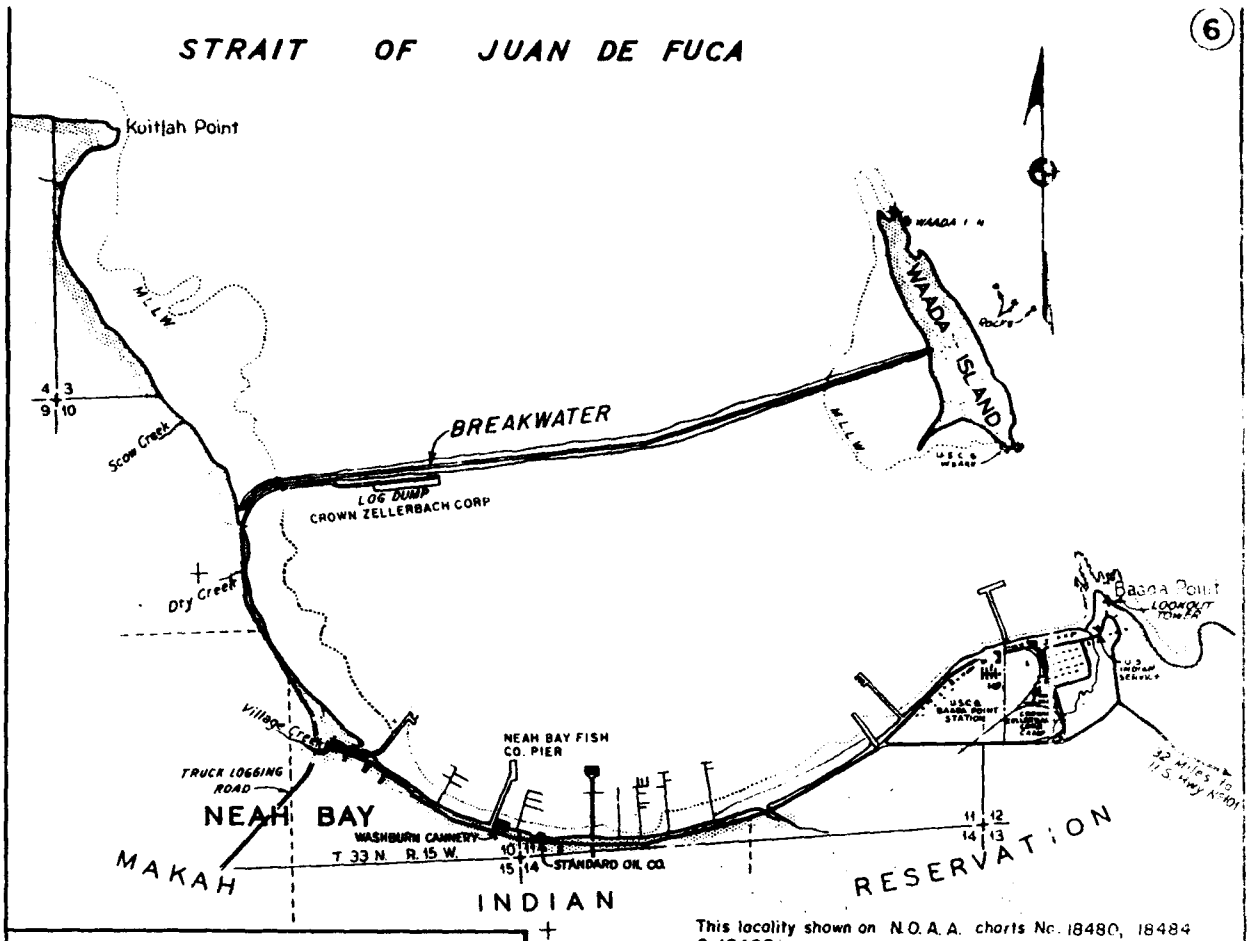
1.05 Needs. Fishing, forestry, and tourism are the principal industries of the Makah Indian Tribe. Fishing grounds in the vicinity of Neah Bay are among the richest and most productive in Washington state. The abundance of such species as salmon, halibut and black cod provides a major source of employment and income for tribal and non-Indian commercial fishermen. Neah Bay's locational advantage, however, also subjects the area to

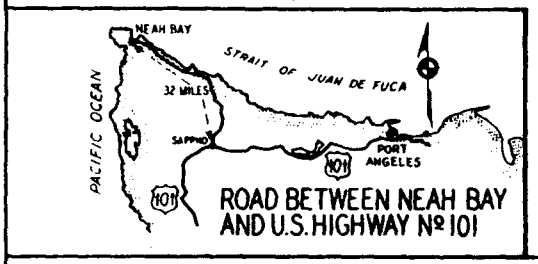




STUDY AREA AND VICINITY MAP

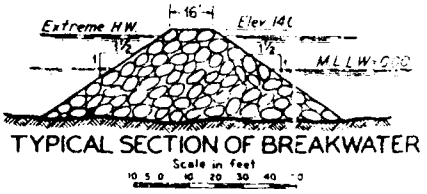
FIGURE 1 1





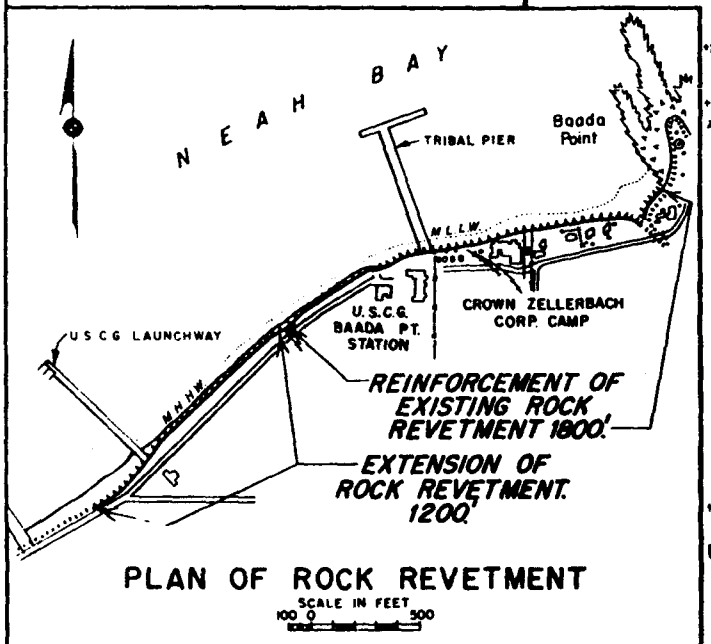
ROAD BETWEEN NEAH BAY AND U.S. HIGHWAY Nº 101

This locality shown on N.O.A.A. charts No. 18480, 18484 & 18485



TYPICAL SECTION OF BREAKWATER

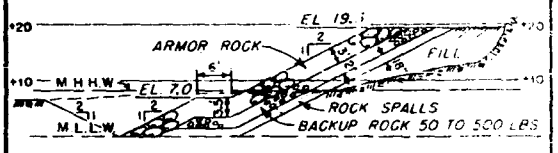
Scale in Feet



PLAN OF ROCK REVETMENT

SCALE IN FEET

100 0 500



TYPICAL SECTION
ROCK REVETMENT EXTENSION

SCALE IN FEET

10 5 0 10 20

NEAH BAY
WASHINGTON
EXISTING PROJECT MAP

SCALE IN FEET

1000 500 0 1000 2000 3000 4000

U.S. Army Engineer District, Seattle, Washington
Revised September, 1979

U. S. Highway Nº 101

FIGURE 1-2

severe weather conditions. During stormy weather, waves on the Strait of Juan de Fuca can exceed 20 feet in height and, although mostly confined to the winter months, can occur throughout the year. Neah Bay receives some wave protection (depending on the storm intensity and direction) from the Federal breakwater connecting Waada Island and the mainland. However, wind-generated waves out of the north through east come into the entrance to Neah Bay, causing significant wave action throughout the bay. This wave attack is most severe at Baada Point and along the south shore of the bay and was responsible for destroying or severely damaging 14 boats in 1983 and sinking 5 boats in 1988 and two boats in 1989. The Indian and non-Indian commercial fishery is now a multi-species, year-round activity. If winter wave protection at Neah Bay were available, both tribal and non-Indian commercial fishermen would be able to avoid hours of additional travel time and costs moving from existing winter moorage at harbors east of Neah Bay, including Port Angeles, Port Townsend, and Bellingham, and thereby increase their net income.

1.06 Previous Corps of Engineers Studies or Reports.

a. Review of Reports on Navigation Improvements, Neah Bay (Hoko River - Clallam Bay), Washington, 1968. This General Investigations study considered improvements to Neah Bay and other communities in the area. The report proposed constructing two rubblemound breakwaters at the entrance to Neah Bay to provide protection from ocean waves, and dredging and removal of rock pinnacles to create an entrance channel 24 feet deep and 400 feet wide. The project was not economically justified and the study was terminated.

b. Section 107 Reconnaissance Study, 1980. In response to a request from the Makah Tribe, a Section 107 reconnaissance study was completed in December 1980 of a potential small boat basin at Neah Bay. The study indicated the project was economically infeasible due to the high cost of barging in rock for the breakwater. Subsequently, a rock quarry was developed at Neah Bay which would significantly reduce the cost of breakwater rock.

c. Northern Olympic Peninsula Shallow Draft Navigation Improvement Study, 1983-1988. A new study of navigation improvements for Neah Bay, Clallam Bay, and Port Angeles was begun under the Puget Sound and Adjacent Waters, General Investigations authority. The Makah Tribe was the local sponsor for the Neah Bay part of the study. The reconnaissance study plan of improvement consisted of a 35-foot-deep navigation channel and turning basin for loading log ships and a rubblemound breakwater and entrance channel for a small boat basin at Baada Point. A reconnaissance report and plan of study was approved by higher authority and a feasibility study begun in May 1984. Environmental baseline studies, geotechnical studies, and economic studies were done for the log channel and three alternative marina locations along the bay. The deep draft channel and marina were not economically justified and the project was reformulated. At the Makah Tribe's request, the deep

draft channel was eliminated and a barge loading facility for loading wood chips, logs, or quarry rock proposed for the west end of the bay. A commercial fishing boat marina would be co-sited with the barge loading facility and the two facilities would be protected by a common breakwater. Further study indicated that the combined barge loading facility/marina was not economically justified. Accordingly, the navigation study was deferred until new economic conditions should warrant further study.

d. Neah Bay Navigation Improvement Study, Section 107. The present small boat basin study was initiated in February 1990 in response to the Makah Indian Tribe's letter of January 8, 1990 (see Appendix B, Part 1), citing significant increases in commercial fishing in the winter and in potential year round charter operations.

1.07 Pertinent References. The following documents are pertinent to the general scope of the present study:

Section 107 Reconnaissance Report, Neah Bay Small Boat Harbor, Neah Bay, Washington, December 1980, Corps of Engineers, Seattle District.

Draft Reconnaissance Report and Plan of Study, Puget Sound and Adjacent Waters, Washington, Northern Olympic Peninsula Shallow-Draft Navigation Study, August 1983, Corp of Engineers, Seattle District.

Continuing Authorities Initial Appraisal Report, Neah Bay, Washington, Small Boat Harbor Study, May 24, 1990, Corps of Engineers, Seattle District.

Feasibility Cost Sharing Agreement between the United States of America and the Makah Indian Tribe for the Neah Bay Navigation Improvement Study, signed August 13, 1992. Includes scope of studies for this report.

Review of Reports on Navigation Improvements, Neah Bay (Hoko River - Clallam Bay), Washington, February 1968, Corps of Engineers, Seattle District.

Marina Site Planning and Feasibility Study, May 1980. Prepared for the Makah Tribal Council by Reid, Middleton and Associates, Inc., Edmonds, Washington.

Master Plan and Feasibility Study, Marine and Heavy Equipment Repair Facility and Commercial Fishing Fleet Moorage, July 1977. Prepared for the Makah Indian Nation by Reid, Middleton and Associates, Inc., Edmonds, Washington.

Makah Coastal Zone Management Program, dated 1980, revised 1993.

Other references pertinent to the social, economic, engineering and design aspects of the study are listed in the accompanying appendices. The environmental base line study reports generated during the Shallow Draft Navigation study are listed in the Environmental Assessment (EA) bibliography.

SECTION 2. PLANNING OBJECTIVE AND CRITERIA

2.01 Planning Objective. The planning objective for this study is to provide a safe, protected year round small boat harbor at Neah Bay and improve travel efficiencies for Indian and non-Indian commercial fishing vessels.

2.02 Planning Criteria.

a. General. In formulating a plan to meet the planning objective, a number of planning criteria were considered. These criteria were used to screen and evaluate alternative plans and to measure each plan's contribution to the national economic development (NED), environmental quality (EQ), regional economic development (RED), and other social effects (OSE) accounts from the Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies of March 1983. The comparative evaluation of alternative plans developed during initial plan formulation is presented in section 3. Not all the criteria are compatible and no plan could fully satisfy all of them. However, the recommended plan (see section 4) comes the closest to satisfying the criteria. Applicable planning criteria for the study are presented in the following paragraphs under the account to which they are primarily related.

b. National Economic Development Criteria. The NED criteria are used to evaluate the effects of alternative plans on the NED account which displays changes in the economic value of the national output of goods and services. The pertinent NED criteria are as follows:

- To provide year round protection from storm generated waves for commercial fishing vessels while moored at Neah Bay and when in need of a harbor of refuge.

- Provide an appropriately sized entrance channel and moorage basin for 10-foot draft commercial fishing boats at tides as low as -3.65 feet mean lower low water (MLLW).

- Reduce wave induced damages to commercial fishing boats.

- Reduce storm damages to the Makah fish processing dock adjacent to the marina site.

- Reduce commercial fishing boat running time and costs while enroute from port to fishing grounds and from fishing grounds to fish buying stations and moorage.

- Provide room within the breakwater for future expansion of marina moorage floats and services.

- Measure economic efficiency of alternative plans by

net benefit analysis (net benefits equal total average annual benefits minus total average annual costs).

o Use the congressionally mandated Federal interest rate to determine the present worth of annual costs and annual benefits (currently 8-1/4 percent).

o Use a 50-year project economic analysis period to evaluate plans.

o Ensure that each separate unit or purpose of a plan provides benefits at least equal to its cost unless combined beneficial NED and EQ effects outweigh combined adverse NED and EQ effects.

o Include in average annual cost estimates interest and amortization of construction costs and provisions for annual maintenance, operation, and major component replacement.

o Include all actions in each plan necessary to realize its economic benefits.

o Ensure that plans are implementable within a range of likely future economic conditions.

See Section 3, "Formulation and Evaluation of Alternatives," and appendix C, "Economic Analysis and Cost Sharing," for application of the NED criteria.

c. Environmental Quality Criteria. The EQ criteria are used to evaluate the effects of alternative plans on the EQ account which displays nonmonetary effects on significant natural and cultural resources. The EQ criteria includes those imposed by Federal, state, and local regulations and those uniquely related to the Neah Bay project area. The significant environmental resources of this area are described in the Environmental Assessment (EA). The pertinent EQ criteria are as follows:

o Preserve the natural and beneficial values of the undeveloped portions of the saltwater flood plain in the study area in conformance with Executive Order (EO) 11988. The requirements of EO 11988 are presented in more detail in the EA.

o Preserve the wetlands in the study area in conformance with EO 11990. The requirements of EO 11990 are presented in more detail in the EA.

o Preserve important or critical fish and wildlife habitats in the study area.

o Preserve or salvage significant (as determined by National Register of Historic Places criteria) historic and prehistoric cultural resource sites affected by potential project construction or effects in accordance with the Historic Preservation Act of 1966; the Reservoir Salvage Act of 1960, as

amended by Public Law 93-291; EO 11593; and the Archaeological Resources Protection Act of 1977.

o Comply with the State of Washington Shoreline Management Program as administered by Clallam County for that portion of the project lying outside the Makah Indian Reservation. Comply with the Makah Coastal Zone Management Plan and other applicable Makah land use plans for that portion of the project within the Reservation.

o Protect any threatened or endangered species in the study area and their critical habitat.

o Preserve water quality in the study area.

o Preserve recreational values within the study area.

d. Regional Economic Development Criteria. The RED criteria are used to evaluate the effects of alternative plans on the RED account which registers changes in the distribution of regional economic activity that result from each alternative plan. The pertinent RED criteria are as follows:

o Increase employment in Clallam County and on the Makah Reservation during implementation.

o Increase net income to county and reservation businesses during plan implementation.

o Contribute to county and reservation development and growth by reducing constraints to commercial fishing boat economic activity.

e. Other Social Effects Criteria. The OSE criteria are used to evaluate the effects of alternative plans on the OSE account which registers plan effects from perspectives that are relevant to the planning process, but are not reflected in the other three accounts. The categories of effects in the OSE account include urban and community impacts; life, health, and safety factors; displacement; long-term productivity; and energy requirements and energy conservation. The pertinent OSE criteria are as follows:

o Decrease risks to safety and injury for commercial fishermen navigating Neah Bay.

o Increase cohesion between communities of the northern Olympic Peninsula.

o Avoid inconvenience to commercial fishing boat operators from having to make long trips from the fishing grounds near Neah Bay to ports farther east in the Strait of Juan de Fuca or in Puget Sound.

- o Avoid decreasing aesthetic values in the study area.
- o Avoid increased noise levels in the study area.

SECTION 3. FORMULATION AND EVALUATION OF ALTERNATIVES

3.01 Plan Formulation Approach. The plan formulation process began with the identification of the planning objective and the planning criteria. Structural and nonstructural alternatives were then identified to address the planning objective. Alternatives which satisfied the planning objective emerged from the preliminary screening and were further evaluated and refined. Refinements were based on the results of additional technical studies and interagency and local sponsor coordination to formulate realistic alternatives. Final alternatives were evaluated against the planning criteria, and a detailed system of accounts was developed to measure their contribution to the NED, EQ, RED, and OSE accounts of the Water Resource Council's Principles and Guidelines. Based on the results of this analysis, the alternative that resulted in maximum net economic return, consistent with protecting environmental quality, was designated the recommended plan.

3.02 Preliminary Analysis and Screening of Alternatives. Conceptual alternatives formulated in response to the need for a protected boat harbor at Neah Bay were:

- o no action
- o summer wet moorage with additional winter dry storage
- o year round wet moorage with breakwater protection

3.03 Plan Formulation Results. As a result of preliminary screening, summer wet moorage with winter dry storage was eliminated as being unresponsive to the planning objective and inappropriate for the efficient maintenance of the large commercial fishing boats used today. No action was carried into the final analysis for comparison with the selected plan. Year round wet moorage with breakwater protection was selected as the alternative that satisfies the planning objective of providing a protected year round harbor while avoiding adverse environmental impacts. Four variations of breakwater construction with and without bridge pontoons were considered in detail. The variation which incorporates one bridge pontoon with a rubblemound breakwater was chosen as the recommended plan. A description of the alternatives follows.

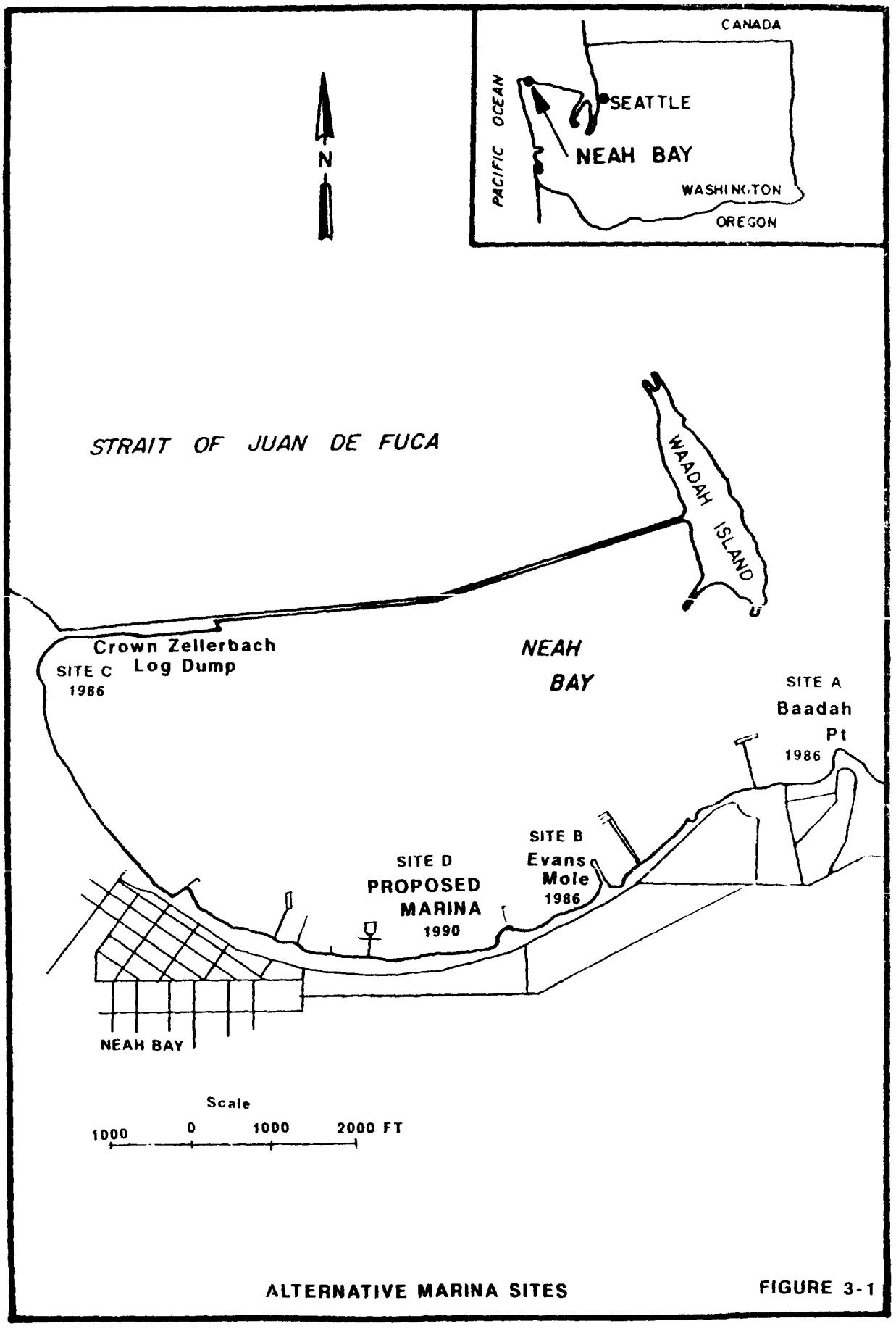
3.04 Alternative 1 - No Action. The concept of no action reflects the "without" project plan condition and provides the basis for comparison of the other concepts and the recommended plan. No action would result in the continued loss of business revenues and employment opportunities for the Makah tribe. Fishing vessels that seek refuge in Neah Bay in stormy weather will continue to take a beating and some will be run ashore or grounded from time to time. The Makah Fish Company wharf will

continue to sustain storm damage from moored boats beating the pilings. Commercial fishing boats that would prefer to off load fish and take on fuel and supplies near to the ocean fishing grounds will continue to bypass Neah Bay, spending 3 or 4 days running time for the round trip between Neah Bay and the protected homeport farther up the Strait or in Puget Sound. Tribal fishermen will continue to commute from their homes in Neah Bay to Port Angeles (150 miles round trip), living there temporarily, in order to service, oversee, and load their boats while moored there. This practice is very expensive, inconvenient, inefficient, and sometimes hazardous due to icy road conditions. The existing moorage at Neah Bay would continue to be used in the summer and early fall season mostly by recreational fishing craft, particularly trailerable boats. The no action alternative was dismissed as being unresponsive to the planning objective of providing a protected small boat harbor at Neah Bay.

3.05 Alternative 2 - Summer Wet Moorage with Additional Winter Dry Storage. It is now a practice of tribal fishermen to remove trailerable boats from the water via an existing boat ramp and store them at their residence during the winter. However, this practice is generally limited to boats under 27 feet in length. Before settlement by Euroamericans in the area, tribal fishermen carried sealing and whaling canoes ashore for seasonal storage and out again. With the adoption of small commercial fishing boats, tribal members have in the past pulled boats up onto the beach for storage by means of a windlass and rollers on planks. The increased size of some tribal fishing boats and the advantage of protected wet moorage in quicker servicing and mobilization for the fishing grounds has caused this practice to be discontinued. A very large hoist or marine ways would be necessary to pull these boats into dry storage. There is little market for pulling large fishing boats out of the water except for extensive repairs at large repair centers staffed by a professional marine workforce. There is also little upland area available adjacent to the shoreline for dryland storage. This alternative was dismissed as being unresponsive to the planning objective of providing a protected small boat harbor at Neah Bay.

3.06 Alternative 3 - Year Round Wet Moorage with Breakwater Protection.

a. Alternative Site Analysis. A prime consideration during previous studies was selection of a suitable site for marina development within Neah Bay. The Tribe's engineering consultant considered three alternative sites for development (Reid, Middleton and Associates, 1977 and 1980). The locations of the proposed sites are shown in figure 3-1. One element of site selection was elimination of environmentally unacceptable sites. During the Northern Olympic Peninsula Shallow Draft (NOPSD) feasibility study, Seattle District and the Tribe carried on extensive coordination with environmental agencies and scoped a series of studies designed to provide site-specific information on nearshore communities, waterfowl, marine mammals, endangered



ALTERNATIVE MARINA SITES FIGURE 3-1

species, and fishery resources existing in Neah Bay. The resulting field surveys were conducted by the University of Washington School of Fisheries, the U.S. Fish and Wildlife Service and other professional biologists. During the present Section 107 study, additional field studies were conducted at site D, which by this time had emerged as the recommended site.

b. Makah Indian Reservation Site Alternatives.

(1) Site A, Baadah Point. Baadah Point is a rocky headland at the mouth of the bay with extensive kelp and eelgrass beds. For the Makah studies and for the initial phase of the NOPSD feasibility study, Baadah Point was the preferred site for marina development. No filling of aquatic habitat for marina uplands would be needed because the area contains sufficient backup land to accommodate a variety of commercial fishing and other activities. The proposed 1,000-foot-long rubblemound breakwater would provide wave protection not only for the proposed commercial and recreational moorages but also for the existing Makah tribal pier. The pier was constructed to offload and transport fish via pipeline to a fish processing plant on shore. However, in practice it can be used only in favorable weather when ships can approach and remain at dockside without incurring damage. The environmental baseline studies conducted in 1986-1987 found this site to be the most biologically diverse and productive of sites A, B, and C. Its macrophyte growth provides cover, food, and protection for juvenile fishes and epibenthic organisms. Baadah Point is so located to receive the cleanest, coldest, and most nutrient-rich ocean water as it enters Neah Bay. Dredging and breakwater placement here would likely cause significant loss of productivity and diversity to the existing resources. Because disturbing this area was environmentally unacceptable, Baadah Point was dropped from consideration.

(2) Site B, Central Bay at Evans Mole. With the elimination of Baadah Point, attention focussed on the comparative merits of Evans Mole and the west bay site. Evans Mole is a manmade fill placed on the nearshore in 1965 to be used as a log dump and bargeloading platform. It was proposed to place a rubblemound breakwater at the mole area to protect a moorage basin to be located to the west. The site is characterized by clean, fine, sandy eroding beach west of the mole with an accreting beach of coarse sand and gravel just east of the mole where the most productive horse clam bed is located. Baseline studies showed Evans Mole to be the next most biologically productive area of A, B, and C. Transects run in this area showed some areas of sparse eelgrass and sea lettuce with Dungeness crab. A bivalve survey conducted in 1992 showed that the area east of the mole was more productive for horse clams than site D. The major drawback for marina development at this site is the lack of backup land for parking and marina facilities. There is little upland between the water and the main highway that skirts the shoreline. Directly across the street is a residential area that the Tribe wishes to preserve.

Development at this site would require filling of intertidal habitat, which would likely be unacceptable environmentally. At the Tribe's request, the site was eliminated in favor of site D.

(3) Site C, West Bay (Crown Zellerbach Log Dump). This site is at the west end of the bay adjacent to the Corps of Engineers breakwater. It is a former log dump and staging area for a log rafting facility which Crown Zellerbach Paper Company formerly operated here for many years. It is reached by a one half mile long gravel road running from the west edge of town and issuing onto the breakwater. There are no permanent utility lines to the area. The bay bottom near the log dump is characterized by thick silt, decomposing wood chips and detritus and little epibenthic growth. The area contains the least productive habitat of A, B, C, and D. Drawbacks to siting a marina here are the cost of bringing utilities to the area, the necessity of bringing all marina traffic through the heart of town, and the isolation from the community and distance from a business park and shopping center being developed to serve tourists and commercial fishermen. During the Shallow Draft Navigation feasibility study, the site was considered for a barge loading facility and commercial fishing marina to be co-sited and protected by a single rubblemound breakwater. In 1988 the barge/marina project was found to be not economically justified. However, the Tribe wants to avoid any development here that would preclude its potential for barge and heavy industrial use; hence, the site was eliminated in favor of Site D.

(4) Site D, Central Bay East of Makah Fish Dock. With initiation of the Section 107 study in 1990, site D, just east of the Makah Fish Company dock, was chosen as the preferred site. The site is a shallow, sloping, sandy beach breaking off rapidly at elevation -6 feet to -18 feet and then more gradually to -25 feet and deeper. An area being developed as a shopping center is nearby and would be convenient to marina patrons. It is close to utility and road connections and is adjacent to tribally owned upland planned for marina parking. Marina development here is consistent with the Makah Tribal Council's Coastal Zone Management Plan. The following breakwater variations were sited at site D.

c. Preliminary Wet Moorage Alternatives. The following variations of Alternative 3 were considered early in the feasibility study phase then dropped from the final alternatives.

(1) Variation 1, Rubblemound/Pile Breakwater (Reconnaissance Study Plan). The Corps of Engineers Initial Appraisal Report, dated May 24, 1990, proposed a 275-boat marina at site D. A 750-foot-long rubblemound breakwater would protect the eastern side of the marina from the larger ocean waves coming into the entrance of Neah Bay while a 1,150-foot long timberpile breakwater would protect the northern side from the smaller waves generated within the bay. During the reconnaissance study phase, this plan was modified in several ways. The layout was moved westward, the plan was changed from a treated wood pile

breakwater to a concrete pile and timber plank structure. The design depth of the moorage basin was -14 feet with 190,000 cubic yards (c.y.) of material to be dredged for beneficial use or openwater disposal. The cost was estimated to be $5,347,000, including $3,033,000 for the breakwater, $5,000 for USCG navigation aids, $612,000 for the moorage basin dredging, and $1,697,000 for the marina facilities (April 1992 prices, 8-1/2 percent interest rate). Based on average annual benefits of $647,000 and average annual costs of $511,000, the benefit-to-cost ratio (B/C) was 1.3 to 1.

During the feasibility study phase this plan underwent further changes. The marina was downsized to accommodate 200 commercial fishing vessels and the north breakwater was modified to a steel pile and concrete panel design supported laterally by adding quarry spalls and armor rock to the breakwater base. A fish passage opening was added in the breakwater and a bridge pontoon was incorporated into the rubblemound breakwater near shore. See Variation 1 under Final Alternatives for the plan that evolved from this early alternative.

(2) Variation 2, Rubblemound/Pile Breakwater incorporating Two or More Bridge Pontoons. In 1991 the Makah Tribe purchased 5 bridge pontoons surplused from the original Interstate 90 floating bridge across Lake Washington. The pontoons are 59 feet wide with lengths varying from 218 feet to 350 feet. The pontoons were towed to Neah Bay and moored temporarily at site C. The Tribe hoped to use some or all of the pontoons in the breakwater for the new marina. The pontoons would be sunk and stabilized on a rubblemound foundation and used to replace some of the rubblemound/concrete pile breakwater proposed in the Corps reconnaissance plan. The deck of the pontoons would provide a broad, flat working surface for marina related activities. However, the quantity of rock needed to build up a base for these wide pontoons from depths of -25 feet MLLW was excessive when compared with a comparable rubblemound breakwater.

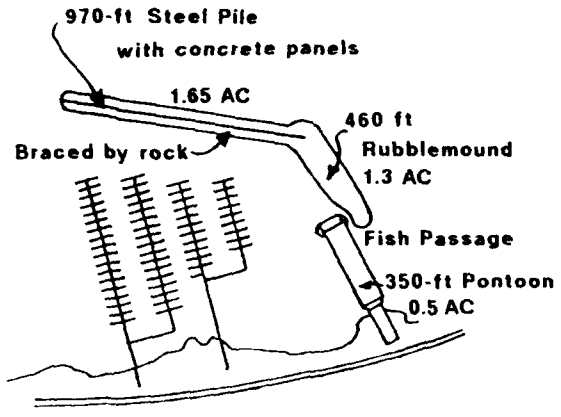
A plan for 362 moorages incorporating two pontoons was briefly considered. Under this plan, one pontoon would be placed at right angles to shore on the shallow shelf adjacent to shore and another pontoon placed on a rock foundation in deeper water at the end of the north breakwater. The north breakwater would be completed by 1,323 feet of rubblemound/pile structure. A dock would be built on the side adjacent to the moorage basin to load large vessels. It is estimated that this variation would cost $12,677,000 including $5,320,000 for the breakwater, $4,000 for USCG navigation aids, $700,000 for the moorage basin dredging and disposal of 140,000 c.y. and associated mitigation, $6,307,000 for the marina facilities, $90,000 for non-creditable lands, and $256,000 for interest during construction. Annual operation and maintenance costs are estimated at $83,000. However, it is not expected that there will be enough vessels in the projected commercial fleet to provide transportation cost saving benefits for more than 200 boats. Therefore, assuming annual benefits of $1,002,000 and annual costs of $1,149,000, the benefit-cost ratio

is 0.87 to 1. (October 1993 prices, 8-1/4 percent interest rate). By request of the local sponsor, this alternative was eliminated in favor of Variation 3 under Final Wet Moorage Alternatives, which incorporates one pontoon in shallow water.

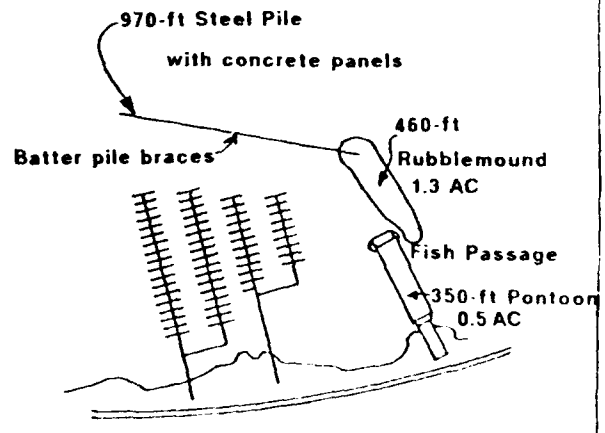
d. Final Wet Moorage Alternatives. During detailed design the following final variations in breakwater construction materials were considered. In all of the following plans, two breakwaters were used to provide wave protection on the north and east sides. The proposed site is sheltered by the natural shoreline on the west side. The breakwaters follow a similar alignment in which the east breakwater extends approximately 350 feet into the bay in a northerly direction. The north breakwater is approximately 1,450 feet long (1,430 feet long for pile breakwater variations) and has a dog-leg shape that overlaps the outer end of the east breakwater. The breakwaters are separated from each other by 50 feet to provide a passage for the near shore migration of juvenile salmon. In response to environmental agency concern, the initial layout was moved farther into deep water to reduce the area to be dredged for the moorage basin from 11.4 acres to 5 acres, thus minimizing impacts to aquatic habitat.

(1) Variation 1, Rubblemound/Rock-Braced Pile Breakwater incorporating One Bridge Pontoon.

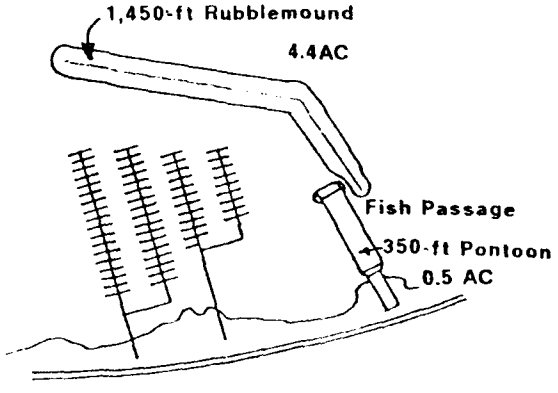
The breakwater protecting the moorage basin in this variation would incorporate one pontoon placed on the shallow water shelf nearest shore. The pontoon would be floated over a previously prepared foundation and allowed to settle at low tide. The pontoon would then be filled with sand to prevent refloating. Quarry spalls and armor rock would be placed around the base of the pontoon to prevent movement by storm waves. Cathodic protection would be installed to prevent deterioration of interior steel reinforcement. The north breakwater would consist of a 970-foot-long segment of steel pile supported concrete panels stabilized by a rubblemound base and a 460-foot-long segment of rubblemound built to the full breakwater height of +18 feet MLLW. The pile breakwater would give protection from smaller energy waves generated within the bay. The investment cost of variation 1 is estimated at $8,290,000, including $4,501,000 for the breakwater, $4,000 for USCG navigation aids, $410,000 for the moorage basin dredging of 50,000 c.y. and associated mitigation, $3,200,000 for the marina facilities, $77,000 for non-creditable lands, and $169,000 for interest during construction (IDC). Annual operation and maintenance costs are estimated at $75,000. Based on annual benefits of $1,002,000 and annual costs of $779,000, the net benefits per year are $223,000 and the benefit-cost ratio is 1.29 to 1. (October 1993 prices, 8-1/4 percent interest rate.) With the local sponsor's consent, this variation was rejected in favor of variation 3 because of the high cost of the pile breakwater segment and availability of cheaper material from a nearby rock quarry, and because the breakwater could be constructed in a simple manner using readily available earth moving equipment.



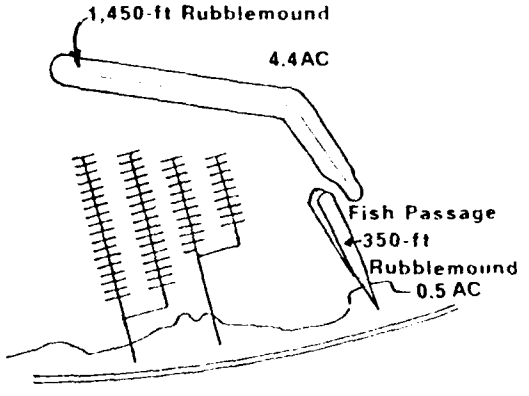
VARIATION 1



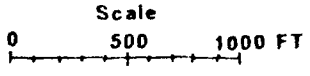
VARIATION 2



VARIATION 3 - RECOMMENDED PLAN



VARIATION 4



FINAL BREAKWATER VARIATIONS

FIGURE 3-2

(2) Variation 2, Rubblemound/Batter Pile-Braced Pile Breakwater incorporating One Bridge Pontoon.

In this alternative the east breakwater would utilize one concrete bridge pontoon and the first 460 feet of the north breakwater (the dog-leg) would be identical to that in variation 1. However, in variation 2, the rubblemound portion of the north breakwater would terminate at the beginning of the pile breakwater. The steel piling and concrete panels would extend for the full 40-foot height of the structure. Pile spacing would be reduced from 6-foot centers to 4 feet and each of the pilings would require a batter pile for lateral support. The investment cost of variation 2 is estimated at $9,700,000, including $5,828,000 for the breakwater, $4,000 for USCG navigation aids, $410,000 for the moorage basin dredging of 50,000 c.y. and associated mitigation, $3,200,000 for the marina facilities, $63,000 for non-creditable lands, and $195,000 IDC. Annual operation and maintenance costs are estimated at $75,000. Based on annual benefits of $1,002,000 and annual costs of $891,000, the net benefits per year are $111,000 and the benefit-cost ratio is 1.12 to 1. (October 1993 prices, 8-1/4 percent interest rate.) Like variation 1, this high cost variation was rejected in favor of variation 3 for reasons of low cost rock availability and easy constructibility.

(3) Variation 3, Rubblemound Breakwater incorporating One Bridge Pontoon. In this alternative the east breakwater would utilize one bridge pontoon as in variations 1 and 2, but the north breakwater would be constructed entirely of rock for its full length. The top elevation would be +18 feet MLLW for the entire 1,450-foot length.

(a) Nearshore Dredging Variation. In this plan, the marina floats were arranged near shore and construction of a moorage basin to accommodate large commercial fishing boats required dredging 151,000 cubic yards and destroying 11.4 acres of aquatic habitat commencing with a shallow bench at elevation +2 feet MLLW and extending to waterward to elevation -15 feet MLLW. The area to be dredged included 4.3 acres of intertidal habitat between elevations +2 ft and -2 ft MLLW, considered potentially valuable as non-commercial clam habitat. Construction of the north breakwater near shore saves cost by reducing the quantity of rock foundation as compared to a similar breakwater constructed in deeper water. However, dredging in shallow water increases the dredging quantities and the dredging cost. The investment cost of the nearshore variation is estimated at $8,186,000, including $3,582,000 for the breakwater, $4,000 for USCG navigation aids, $1,080,000 for the moorage basin dredging of 151,000 c.y. and associated mitigation, $3,200,000 for the marina facilities, $156,000 for non-creditable lands, and $164,000 IDC. Annual operation and maintenance costs are estimated at $71,000. (October 1993 prices, 8-1/4 percent interest rate). Based on annual benefits of $1,002,000 and annual costs of $759,000, the net benefits per year are $243,000 and the benefit-cost ratio is 1.32 to 1. In response to

environmental agency concerns, this plan was dropped in favor of the offshore variation.

(b) Offshore Dredging Variation (Recommended Plan).

In response to environmental agency concern, the north breakwater and marina floats were moved into deeper water in order to avoid dredging in the 4.3 acre intertidal shelf between +2 feet to -2 feet MLLW. This revision reduced the total dredging acreage from 11.4 acres to 5 acres, mostly below the area of prime concern. The net effect of increasing rock quantities and reducing dredging quantities was to decrease the project cost by about $200,000, including potential increased mitigation costs of $60,000 to enhance additional aquatic habitat.

The investment cost of Variation 3, Offshore plan, is estimated at $7,901,000, including $4,037,000 for the breakwater, $4,000 for USCG navigation aids, $410,000 for the moorage basin dredging of 50,000 c.y. and associated mitigation, $3,200,000 for the marina facilities, $90,000 for the value of non-creditable lands, and $160,000 IDC. Annual operation and maintenance costs are estimated at $75,000. (October 1993 prices, 8-1/4 percent interest rate.) Based on annual benefits of $1,002,000 and annual costs of $739,000, the net benefits per year are $263,000 and the benefit-cost ratio is 1.36 to 1. Upon approval by the Makah Tribal Council, this variation was chosen as the recommended plan (see letter of February 8, 1993 in appendix B, part 2).

(4) Variation 4, breakwater Entirely Rubblemound.

The north breakwater in variation 4 would be like variation 3, entirely rubblemound. For the east breakwater, the bridge pontoon would be replaced by a rubblemound breakwater with a top elevation of +18 feet MLLW. The investment cost of variation 4 is estimated at $7,910,000, including $4,046,000 for the breakwater, $4,000 for USCG navigation aids, $410,000 for the moorage basin dredging of 50,000 c.y. and associated mitigation, $3,200,000 for the marina facilities, and $90,000 for non-creditable lands, and $160,000 IDC. Annual operation and maintenance costs are estimated at $75,000. (October 1993 prices, 8-1/4 percent interest rate). Based on annual benefits of $1,002,000 and annual costs of $740,000, the net benefits per year are $262,000 and the benefit-cost ratio is 1.35 to 1. This variation was rejected by the local sponsor in favor of variation 3 which includes a pontoon and thus provides a broad, flat working surface for marina related activities.

3.10 Variations 3 and 4 are the most economically efficient plans, i.e., they maximize net benefits. Annual costs of Variation 3 are $1,000 less than Variation 4. Should further cost estimate refinement show that Variation 4 is the NED plan, the local sponsor will be responsible to pay 100 percent of the additional cost of variation 3 over variation 4. A comparison of variations 2, 3, and 4 with "no action" is shown in table 3-1.

TABLE 3-1
SUMMARY COMPARISON OF FINAL ALTERNATIVES

ITEM	ALTERNATIVE 1 NO ACTION Without Project Plan	ALTERNATIVE 3, VARIATION 3 RUBBLEMOUND/ONE PONTOON BREAKWATER RECOMMENDED PLAN		VAR. 2, RUBBLEMOUND/ BATTER PILE BRACED PILE B/W / ONE PONTOON	VARIATION 4 BREAKWATER ENTIRELY RUBBLEMOUND
Plan Description					
1. Structural Measures	None	1,450 ft rubblemound breakwater 350 ft beached pontoon breakwater entrance channel 200-boat moorage facility		970 ft steel pile concrete panel, batter pile braced; 460 ft rubblemd; one pontoon	1,450 ft rubblemound breakwater; 350 ft rubblemnd breakwater
2. Nonstruct. Measures	None	None		None	None
3. Fish & Wildlife Mitigation	Not Applicable	Fish passage opening in breakwater Reestablish intertidal beach		Same as Var 3	Same as Var 3
Estimated Cost					
1. Construction Cost	None	Oct 93 Price	Full Funded Cost 1/	Oct 93 Price	Oct 93 Price
Federal Breakwater 2/	None	$4,041,000	$4,326,000	$5,832,000	$4,050,000
Local Marina Facil.	None	3,610,000	3,864,000	3,610,000	3,610,000
Subtotal	None	$7,651,000	$8,190,000	$9,446,000	$7,660,000
Non-Creditable Lands	None	90,000		63,000	90,000
Interest during Constr		160,000		195,000	160,000
Total Investmt Cost	None	$7,901,000		$9,700,000	$7,910,000
Federal Cost Share	None		$3,475,000	Not Determined	Not Determined
Non-Fed Cost Share of Breakwater, 3/			$ 793,000		
Marina Facilities			$3,864,000		
2. Annual Maint. Cost					
Federal	None	$ 6,000		$6,000	$6,000
Non-Federal	Not Determined	$69,000		$69,000	$69,000

1/ Includes cost escalation to midpoint of construction period.
2/ Includes $4,000 USCG Navigation Aids and $57,000 land value & Fed & Non-Fed LERRD activities.
3/ Includes repayment to Govt by sponsor of $331,000 (10% of CNF - 3.4% LERRD credit).

TABLE 3-1 (cont.)

ITEM	ALTERNATIVE 1 NO ACTION Without Project Plan	ALTERNATIVE 3, VARIATION 3 RUBBLEMOUND/ONE PONTOON BREAKWATER RECOMMENDED PLAN	VAR. 2, RUBBLEMOUND/ BATTER PILE BRACED PILE / ONE PONTOON	VARIATION 4 BREAKWATER ENTIRELY RUBBLEMOUND
Response to Planning Criteria				
Planning Objective: protected year round comm'l fishing harbor	No	Yes	Yes	Yes
1. National Economic Development				
Depth for 10-ft draft; safety, no tide delay	No	Yes	Yes	Yes
Protected fish dock	Continued damage	Avoid $15,000 dock damage	Same as Var 3	Same as Var 3
Reduce damage to boats	Continued damage	$53,000 reduction	"	"
Reduce comm'l vessel operating costs to fishing grounds	Continue to make long trips from exist. protected marinas	$367,000 reduction	"	"
Reduce vessel operating costs to fish processor	Continue to make long trips from fishing grnds to processor	$176,000 reduction	"	"
Value of crew time saved	Crews continue to sail long hours	$356,000	"	"
Reduce launching costs for small comm'l boats	Retrieve after each trip in winter	$35,000 reduction	"	"
Total Annual Benefits	None	$1,002,000	$1,002,000	$1,002,000
Total Annual Costs	Not determined	$739,000	$891,000	$740,000
Benefit-to-Cost Ratio	Not applicable	1.36	1.12	1.35

TABLE 3-1 (cont.)

ITEM	ALTERNATIVE 1 NO ACTION Without Project Plan	ALTERNATIVE 3, VARIATION 3 RUBBLEMOUND/ONE PONTOON BREAKWATER RECOMMENDED PLAN	VAR. 2, RUBBLEMOUND/ BATTER PILE BRACED PILE / ONE PONTOON	VARIATION 4 BREAKWATER ENTIRELY RUBBLEMOUND
2. Environmental Quality				
Preserve wetlands	No change	No significant impact; avoids dredging prime habitat; breakwater provides new habitat; mitigation restablishes intertidal beach	No significant impact; Pile B/W has smaller footprint but less new rk habitat than Var 3	Same footprint as Var 3; similar new rock habitat
Preserve critical fish & wildlife habitat	No change	No significant impact; fish passage for juvenile salmon; change to benthic fauna	Same as Var 3	Same as Var 3
Protect threatened, endangered species (bald eagle, peregrine falcon, marbled murrelet, gray whale)	No change	No significant impact	"	"
Preserve cultural resources	No change	Area already disturbed; unlikely sites will be found	"	"
Comply with Makah Coastal Zone Mgmt Plan	Yes	Yes	Yes	Sponsor wants pontoon deck work area; No
Preserve water quality	No change	Minor decrease during construction; No significant change; marina is open for tidal circulation; has sewage pumpout	Same as Var 3	Same as Var 3
Preserve air quality	No change	No significant change	"	"
Preserve recreation	No change	Increased use with wave protection	"	"
3. Regional Development				
Employmt during Constr	No change	Temporary increase	"	"
Longterm employment	No change	Yes, secondary effects of project	"	"
Net business income	No change	Increased value	"	"
Reservation developmt	No waterfront develmt	Increased value	"	"
4. Other Social Effects				
Decrease navigation safety & injury risk	Continued problem	Longterm beneficial	"	"
Reduce inconvenience of long trips for crews	No change	Immediate decrease in trip time	"	"
Community cohesion	No change	Longterm beneficial	"	Rejected by Sponsor
Aesthetics	No change	Potential longterm beneficial	"	Pontoon more pleasing
Noise levels	No change	No significant impact	"	Same as Var 3

SECTION 4. THE RECOMMENDED PLAN

4.01 Plan Description. The general plan layout is shown on plate 1. The plan consists of Federal construction and maintenance of two breakwaters to protect a 17-acre moorage basin, designation of a Federal entrance channel 800 feet long by 100 feet wide by -15 feet MLLW, non-Federal dredging and maintenance of the moorage basin to a depth of -15 feet MLLW, local project marina facilities, and associated environmental mitigation.

4.02 Navigation Conditions. The existing 8,000-foot-long breakwater across Neah Bay provides protection on the north. However, waves passing through the bay entrance on the east frequently exceed 3 feet in height during winter. While it is often possible to enter the bay in winter, it is not possible to anchor or moor safely for an extended period without risk of damage under existing wave conditions. Mooring floats are removed each fall to prevent damage. Boats that remain at anchor often drag anchor and several vessels are damaged or destroyed each winter. Permanent docks sustain constant damage from waves and wave borne debris.

4.03 Tides and Currents. Tides at Neah Bay are typical of the Pacific coast of North America. Tides are of the mixed type with two unequal highs and lows each day. Extreme tidal elevations range from -3.8 feet to +12.0 feet MLLW. Tidal currents entering and leaving Neah Bay through the harbor entrance can exceed 1/2 knot; however, currents in the vicinity of the proposed marina are minimal and will seldom exceed 0.2 feet per second. See Appendix D, figure D-2, Tidal Current Study.

4.04 Winds and Wind Generated Waves. Prevailing wind directions at Neah Bay are easterly in the fall and winter and westerly in the summer. The strongest winds are from the east and northeast, sometimes reaching speeds in excess of 80 miles per hour. The harbor entrance is exposed to wind waves from the east, and northeast and to ocean swells from the north and northwest. The proposed marina site is located well within the bay and is exposed only to waves from the east and northeast that pass through the entrance, or to waves generated within the bay itself. A 48 mph wind developed over a long fetch in the Strait of Juan de Fuca with a 5 hour duration can generate a 14 foot high wave outside the entrance, but the wave is reduced to 7.5 feet due to refraction and shoaling effects in the bay. Significant wave heights generated within the bay are 2.1 feet and 1.7 feet from the northeast and northwest respectively.

4.05 Longshore Transport. Littoral processes within Neah Bay were altered significantly by construction of the breakwater across the north side of the bay in 1941-44 and by construction of revetments virtually armoring the entire southern shoreline. Several groin-like structures, such as Evans mole, trap material

on their east side, indicating that the predominant littoral drift direction is now from east to west. However, there is no readily apparent source of littoral material. Nearshore littoral processes are probably limited to rearranging of sediment that was in the system prior to construction of the breakwater and revetments.

Between Evans mole and the marina site the beach has undergone severe erosion, probably accelerated by the construction of Evans Mole in 1965. The intertidal beach has retreated landward forming a broad wavecut bench between elevations -4 ft and +4 ft MLLW. In 1990, under authority of Section 14 of the 1946 Flood Control Act, a 1,300-foot long revetment was constructed along this shoreline by the Corps of Engineer to protect the adjacent road and utilities. Farther west, considerable material has collected in the marina site probably as a result of sediments deposited by a small stream that enters the bay at this point forming a shallow delta and trapping littoral drift sediments.

4.06 Geotechnical Investigation. Foundation studies were conducted in Neah Bay during the Northern Olympic Peninsula Shallow Draft Reconnaissance study including foundation borings at the Baadah Point marina site (1981) and side scan sonar studies (1984, for a proposed ship channel north of the present marina site. The underlying rock at Neah Bay is sandstone of the Twin Rivers Formation. This is overlain by a thick wedge of sediment at the shoreline, thinning to a small prism in mid bay. Additional subsurface exploration for the present site was conducted by the Corps of Engineers on May 11-14, 1993. Twelve Vibracore test holes were drilled. Six holes were made within the proposed moorage basin where dredging is proposed, and six borings were made along the breakwater alignment. Six samples from the proposed dredging area were tested for chemical and physical characteristics in accordance with Puget Sound Dredged Disposal Analysis (PSDDA) guidelines. Physically, the samples consist primarily of fine sand. The sediments were found to be acceptable chemically for disposal in open water. Along the breakwater alignment the region near shore consists of 0 to 6 feet of silty sand with shells underlain by 7 feet of sand with small gravel. Away from shore, the surface layer consists of up to one foot of silt underlain by up to 2.5 feet of silty sand with silt layers, and silty sand with shells and gravels. See plate 1 for test hole locations and plate 2 for logs of the six breakwater exploration holes. See appendix D for particle size analyses for three samples.

4.07 Design Criteria. Primary design criteria for breakwater location and alignment were existing bathymetry, direction of wave approach, fish migration, minimizing disruption of intertidal habitat, and maximizing marina flushing. The selection of moorage basin dredged depth, channel widths, and float layout was based on the length, beam, and draft of commercial fishing vessels expected to moor at Neah Bay. Such vessels are 30 to 70 feet long with drafts between 8 and 12 feet.

4.08 Structural Features (Federal).

a. Rubblemound Breakwater (North Breakwater). The north breakwater has a total length of 1,450 feet with an west-east alignment 1,000 feet long that provides wave protection from the north, and a southeasterly trending dogleg 450 feet long that overlaps the north end of the east breakwater providing continuous wave protection from the east. Besides protecting the moorage basin, the west end of the breakwater provides incidental wave protection to the existing Makah fish company dock just west of the marina. Room is left for some additional floats should the Tribe expand the moorage capacity in the future. The overlapping end of the dogleg prevents high energy waves from entering the marina via the fish passage opening between the two breakwaters. The north breakwater would have slopes of 1 vertical (V) on 1.5 horizontal (H) and a top elevation of +18 ft MLLW. The basic cross-section would consist of quarry spalls while the crest and outer face of the breakwater would be protected with a layer of armor rock (2 to 4 tons per piece) extending from the top to an elevation of -5 ft MLLW (see appendix D, 2.03 d and plate 1, for location and structural details). It is designed to protect the marina basin from waves up to and including 7.5 feet in height. A haul road for constructing the north breakwater would extend down the top of the east breakwater, then across the fish passage between the east and north breakwaters, and then down the north breakwater alignment. The haul road would be constructed to an elevation of +11 ft MLLW to allow work to proceed during all but the highest tide conditions. Final placement of the armor rock would bring the top elevation to +18 ft MLLW. After construction, the temporary road between the breakwaters would be removed opening up the fish passage. The rock would be reused on the revetment for the east breakwater.

b. Pontoon Breakwater (East Breakwater). A 350-foot-long by 59-foot-wide by 16-foot-high concrete pontoon salvaged from the Interstate 90 (Lake Washington) floating bridge would be used to construct the east breakwater. After regrading and compacting the existing groundline to create a pad at an elevation of 0.00 ft MLLW, the pontoon would be floated onto the pad on a high tide. Then, approximately 14,000 c.y. of sand from moorage basin dredging would be placed in the pontoon to prevent it from refloating on subsequent high tides. Quarry spalls would be placed to form a 3-foot-thick blanket around the base of the pontoon to prevent erosion of sand at the edge of the pad. The east side of the pontoon would be protected from wave attack by a rock revetment. A sand fill, with a slope of 1V on 5H, would be placed along the inner side of the pontoon to cover the quarry spalls and minimize the potential for providing hiding places for fish that prey on migrating salmon. The completed east breakwater would have a top elevation of +16 ft MLLW. If the design wave of 6.4 feet occurs at high tide, there would be a significant amount of overtopping. Because of the 59-foot-wide top width of the pontoon, overtopping water will enter the marina as sheet flow and should not cause scour or generate waves inside

the basin.

c. Fish Passage Opening. An opening approximately 100 feet long and 50 feet wide at an elevation of about -2 ft MLLW would be left between the two breakwaters as a fish passage for shallow water migration of juvenile salmonids. The opening would also facilitate flushing of the marina basin.

d. Entrance Channel. A Federal entrance channel will be designated just inside the north breakwater. It will be 800 feet long, extending from breakwater STA 12+00 to STA 20+00, and will be 100 feet wide. Existing water depths in the entrance channel area are -23 feet MLLW. For purposes of future Federal maintenance dredging, should that be necessary, the channel depth shall be authorized at -15 ft MLLW.

e. Mitigation: Removal of Evans Mole. Evans Mole, an intertidal fill, would be removed as inkind replacement of 0.5 acres of intertidal clam habitat covered by placement of the pontoon breakwater. The fill would be removed from its top at the 14-foot contour line to its base on the intertidal beach. The armor rock covering protecting the core of Evans Mole would be salvaged and used in breakwater construction. If the core material is suitable for clam habitat, it will be left in place to be distributed along the beach by wave action as beach nourishment. Otherwise, it will be taken to an upland disposal site on the Reservation.

4.09 Structural Features (Non-Federal).

a. Moorage Basin (Dredging and Disposal). The proposed 7.2-acre moorage basin would have a depth of -15 ft MLLW. Approximately 50,000 c.y. of material (including 1 foot of contractor over depth) would be hydraulicly dredged with pipeline disposal as follows:

(1) 14,000 c.y. placed inside the pontoon as ballast.

(2) 1,000 c.y. placed as a sand blanket over the quarry spalls on the marina side of the pontoon as part of the Federal pontoon mitigation.

(3) 5,000 c.y. placed adjacent to the east side of the pontoon as part of beach nourishment.

(4) 30,000 c.y. placed as mitigation for dredging intertidal habitat. The dredged material is primarily coarse sand and would be placed on the eroded beach west of Evans Mole as beach nourishment. The material would be pumped to a temporary disposal site on the upper beach east of the pontoon, confined by a temporary sand berm and dewatered. After dewatering, the material would be pushed onto the intertidal beach as beach nourishment (see Mitigation, paragraph b. below).

The proposed dredged material was sampled and tested and found suitable for openwater disposal according to PSDDA guidelines. Full chemical characterization analyses showed no chemicals with concentrations requiring biological testing. See the environmental assessment (EA) for agency approval of inwater

disposal.

b. Mitigation for Dredging Shallow Subtidal and Intertidal Habitat. The removal of the obstruction of Evans Mole as Federal mitigation will have the additional effect of restoring westerly movement of littoral sediments to the eroded beach west of the mole. Non-Federal mitigation for loss of shallow subtidal and intertidal habitat by dredging consists of one time nourishment of the beach west of the Evans Mole site in order to accelerate the reestablishment of the normal beach profile and productivity.

c. Moorage Facilities. Moorage features include necessary floats, access docks, ramps, water and power connections, rest rooms, sewage connections and pumping facilities, parking areas, etc., necessary to accommodate 200 commercial fishing boats. A vehicle bridge will be provided for temporary access to the pontoon from land. One acre of marina parking is designated on the other side of the road from the bay. Specific marina moorage area features are contained in the local sponsor Section 10 construction permit application (see Public Notice in appendix A, part 2).

4.10 Aids to Navigation. By letter of ( ) the U.S. Coast Guard would install and maintain navigation aids consisting of (to be completed).

4.11 Real Estate.

a. Description and Acreage. It is currently estimated that approximately 11.50 acres of land will be needed for construction, operation, and maintenance of the cost-share portion of the project. See plates 3 and 4 for real estate maps showing the project area. Navigational servitude will be exercised over approximately 7.85 acres of project land below the mean high water (MHW)(+ 7.1 feet). All other land needed for the project is located within the Makah Indian Reservation boundaries and under control of the Tribe. In the immediate project area there is approximately 0.14 acre fee mitigation for removal of that portion of Evans Mole above the MHW line, 0.30 acre of permanent road easement above the MHW needed for access to the Federal breakwater; and 0.36 acre temporary work area easement needed for removal of Evans Mole. If material removed from Evans Mole is found unsuitable for enhancement of clam habitat, the material will be deposited at an upland disposal site (0.69 acre) as shown on plate 4. For construction and subsequent operation and maintenance of the project the Tribe will provide a 0.73 acre borrow area, 0.37 acre for access to the borrow site, and 1.06 acre temporary staging area adjacent to the borrow area. All the land needed for the Project is owned by the Tribe. Included in the total project cost is the estimated fair market value of the lands, easements, and rights-of-way required for the cost-shared portion of the project. A recapitulation of the lands, easements, rights-of-way, and costs for the cost-share portion of the project is provided below.

ESTATE	ACREAGE	ESTIMATED VALUE
Fee Mitigation	0.14	$ 7,200
Permanent access road easements to		
North Breakwater Access	0.30	8,100
Borrow Site Access	0.37	9,500
Permanent borrow area easement	0.73	18,600
Temporary work area easements 1/		
Evans Mole	0.50	250
Borrow area staging area	1.06	2,000
Temporary Upland Disposal site	0.69	0

1/ The values of the temporary work area easements are based on an annual figure and one year availability for use.

b. Navigational Servitude. Navigational servitude will be exercised over project land below the MHW +7.1 feet.

c. Public Law 91-646 and Acquisition. The cost-share portion of the project includes Tribal allotment land, thus no acquisition is needed. The Local Sponsor has the ability and will comply with Public Law 91-646 should acquisition become necessary to accommodate construction of the project. There are no families or businesses which will be temporarily or permanently displaced as a result of this federally-assisted project, therefore resettlement or relocation assistance will not be required. Acquisition of mineral interest will not be required. The land in the project area is not known, or suspected to contain hazardous and/or toxic wastes. Prior to advertisement for construction, the Local Sponsor will make available to the Federal Government all lands necessary for the project by a right-of-entry.

d. Estates. The following estates will be used for this navigation project.

(1) Fee.

The fee simple title to (land to be described), subject, however to existing easements for public roads and highways,

public utilities, railroads, and pipelines.

(2) Permanent Road Easement.

A perpetual and assignable easement and right-of-way in, on, over and across (the land to be described) for the location, construction, operation, maintenance, alteration and replacement of (a) road (s) and appurtenances thereto; together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions and other vegetation, structures, or obstacles within the limits of the right-of-way; (reserving, however, to the owners, their heirs and assigns, the right to cross over or under the right-of-way as access to their adjoining land at the locations indicated in Schedule B); subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

(3) Temporary Work Area Easements during Construction.

A temporary easement and right-of-way in, on, over and across (the land to be described), for a period not to exceed one year, beginning with date possession of the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a work area, including the right to deposit fill, spoil and waste material thereon, to move, store and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the Neah Bay Section 107 Project, together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

(4) Borrow Easement.

A perpetual and assignable right and easement to clear, borrow, excavate and remove soil, dirt, and other materials from (the land to be described) subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges in said land as may be used without interfering with or abridging the rights and easement hereby acquired.

e. Real Estate Cost Estimate. Estimated Federal and Non-Federal costs related to the LERRD value and real estate activities are as follows:

Lands and Damages	$45,650
Federal LERRD Activities	3,000
Non-Federal LERRD Activities	3,000
Contingency of 10% ±	5,165
	$56,815

4.12 Environmental Effects of the Recommended Plan.

a. General. Project construction would have the following environmental effects. Section 6 of the environmental assessment (EA) contains additional information and evaluation.

o Construction of the north breakwater would result in loss of and a change in aquatic habitat. The breakwater footprint would permanently cover 4.4 acres of benthos and feeding habitat, primarily at elevations -10 ft to -24 ft MLLW. ; This area is relatively unproductive at the present time. The rock slopes of the breakwater would provide new habitat for rockfish and other species of marine life that could serve as alternative food sources for prey species. The breakwater would provide substrate for marine algae and associated communities and space for resting waterfowl and raptors. Because of existing low productivity at the depths covered and because changed habitat would result, no mitigation is planned for the north breakwater.

o The pontoon breakwater would permanently cover 0.5 acre of intertidal habitat found marginally productive for clams and presently subject to erosion. Mitigation consists of inkind replacement of habitat by removal of Evans mole, an existing fill covering 0.5 acres of intertidal beach just east of the marina site. Additional mitigation includes placing a sand blanket on the inner side of the pontoon to cover fill rock crevices that could hide fish that prey on juvenile salmons. Rock crevices on the east and south parts of the pontoon revetment will be initially covered by sand and are expected to collect littoral drift sediments.

o The fish passage opening between breakwaters would allow shallow water passage through the marina for juvenile salmon migrants. It would also promote better water quality by improving water circulation through the moorage basin.

o As a result of mitigation planning with environmental agencies, the initial marina layout was redesigned to avoid dredging of shallow intertidal habitat considered valuable as noncommercial clam substrate (see discussion on nearshore and offshore variations in section 3.06 d (3)). The total dredging acreage was reduced from 11.4 acres to 5 acres, virtually all below elevation -2 ft MLLW. Mitigation for the remaining dredging of aquatic habitat would be beach nourishment in conjunction with removal of Evans mole. Removing the impediment of the mole would allow littoral sediments to reenter the

sediment starved beach. In time, natural sorting processes will restore a more productive clam substrate. (For a fuller account of these processes see the EA, section 7.e, Mitigation.) The recommended plan would dispose of dredged sediments at the eroded beach site, thus accelerating the restoration of intertidal habitat by providing an initial steepening of the eroded beach and an initial pool of sediments to be sorted over the beach by wave action. Initial beach nourishment would shorten the time to final restoration. The progress of restoration will be monitored (see Section 4.16.d and EA, section 7 e.).

o Dredging is timed for September 1 through March 15 to minimize impacts to migrating juvenile salmonids.

o The local sponsor will implement an education program to be attended by all marina staff, Tribal council members, and the harbor master to inform them concerning the pertinent Federal and state regulations that affect them and practices that need to be curtailed to decrease adverse environmental impacts from marina operation.

b. Endangered/Threatened Species. Several pairs of bald eagles have been observed to nest within four miles of Neah Bay. Eagles regularly feed in the area, perching near city streets and on existing pilings near the marina site. At least one peregrine falcon nest exists in the vicinity of Neah Bay. Peregrines feed in the area but only rarely. The marbled murrelet is rarely seen in the vicinity of Neah Bay. Biological assessments (BA) were prepared for the bald eagle (threatened), the peregrine falcon (endangered), and the marbled murrelet (endangered). The BA's conclude that the project would not impact any of these species significantly (see the EA, section 6.f).

c. Marine Mammals. The only species of marine mammals that occur regularly in the study vicinity are the river otter, the gray whale (endangered), and the killer whale. A biological assessment concludes that harbor development would not significantly affect any marine mammal species (see EA, section 6.e).

4.13 Cultural Resources and Historic Significance. No impacts to cultural resources are anticipated as a result of this project. Construction of the haul road for the rock breakwater follows an existing roadbed to the water. In the water, the haul road will become the project breakwater. No cultural materials were encountered in these locations. No sites within Neah Bay are listed on the National Register of Historic Places. See appendix B, part 2, for coordination with the Washington State Office of Archaeology and Historic Preservation.

4.14 Project Costs. Estimated project first costs are summarized in table 4-1 and include contingencies. See detailed cost estimates in appendix D.

TABLE 4-1
SUMMARY OF ESTIMATED PROJECT FIRST COSTS

	Oct 1993 Price Level	Full Funded Price 1/
Breakwater Project (Federal)		
1. Breakwaters	$3,568,000	$3,811,000
2. Mitigation Features	12,000	13,000
3. Planning, Engrng, Design	150,000	161,000
4. Construction Management	250,000	276,000
5. Lands, Easements 2/	57,000	61,000
Subtotal - Corps of Engrs	$4,037,000	$4,322,000
6. USCG Navigation Aids	4,000	4,000
TOTAL FEDERAL FIRST COST	$4,041,000	$4,326,000
Marina Facilities (Non-Federal)		
1. Dredging & Disposal	$ 237,000	$ 253,000
2. Mitigation Features	83,000	88,000
3. Moorage Floats, Access	2,066,000	2,208,000
4. Pontoon Access, Utilities	440,000	470,000
5. Contractor Overhead & Profit	284,000	303,000
6. Engineering & Design	310,000	333,000
7. Construction Management	190,000	209,000
TOTAL NON-FEDERAL FIRST COST	$3,610,000	$3,864,000
TOTAL PROJECT FIRST COST	**$7,651,000**	**$8,190,000**

1/ Includes cost escalation to the midpoint of construction.
2/ Includes local sponsor LERRD costs creditable toward their share of total project cost and Federal review & assistance costs. See tables 4-4 & 4-6 for non-creditable lands valued at $51,000 (Fed Project) and $43,000 (Non-Fed Proj).

4.15 Design and Construction Schedule. The planning, design, and construction schedule for the marina project is summarized below and shown in more detail on plate 5. Subject to higher authority approval and availability of funds, the project would be completed in March 1996 assuming the following schedule is maintained.

Submit Final Report to Division office	Jan 1994
Washington, D.C., Corps Review	Feb 1994
Initiate Plans and Specifications	Feb 1994
Request Project Approval	Jun 1994
Sign Project Cooperation Agreement	Sep 1994
Local Sponsor Certifies Land Available	Sep 1994
Advertise Construction	Oct 1994
Award Contract	Dec 1994
Notice to Proceed	Jan 1995
Place, Fill Pontoon	Jan 1995
Fisheries Closure to In-water Activities;	
Manufacture Rock at Quarry	Mar 15 - Jun 15, 1995
Place Rock for North Breakwater	Jun 16, 1995
Dredging & Moorage Facilities	Oct 1995
Breakwater & Marina Facilities Complete	Mar 1996

4.16 Operation, Maintenance, and Replacement. Individual maintenance work items are discussed below and costs are summarized in table 4-2. See appendix D, tables D-4 and D-6 for detailed maintenance cost estimates.

a. Rubblemound Breakwater (Federal). Maintenance of the north breakwater is expected to include replacement of 25 percent of the north breakwater armor stone (8,000 tons) at year 25.

b. Pontoon Breakwater (Federal). The east breakwater will require only minor maintenance during the 50-year project life.

c. Fish Passage Opening (Federal). Immediately after construction, the elevation in the passage would be between 0 ft and -2 ft MLLW. Sand, carried westward by littoral processes, may be deposited in the passage, and if not removed, eventually block the passage. The rate of deposition is estimated at no more than 1,000 c.y. in five years. The sand would be excavated at low tide or dredged by clamshell from the east breakwater and placed in an updrift location between the marina and the present location of Evans mole as beach nourishment. (Assumption of this maintenance responsibility is being considered by the local sponsor in conjunction with non-Federal moorage basin maintenance dredging, with appropriate cost sharing credit.)

d. Monitoring of Evans Mole Removal (Federal). Restoration of the mitigation beach as a result of removal of Evans Mole will be monitored by the Corps of Engineers by aerial photo inspection or site visit at years 3, 5, 8, and 10 and the results coordinated with the concerned agencies. A clam reconnaissance survey will be conducted at year 5. No monitoring will be done after year 10 and no mitigation maintenance will be attempted.

e. Entrance Channel Dredging (Federal). Since the Federal entrance channel is now below project depth, no dredging is anticipated during the 50-year project life.

f. Moorage Basin Dredging (Non-Federal). The breakwaters are expected to block sediment being transported in a westerly

direction along the south shore of Neah Bay. A minor amount of material could be transported eastward into the marina at the west opening. Moorage basin maintenance dredging would not likely exceed 5,000 c.y. every 5 years.

g. Pontoon Deck Maintenance (Non-Federal). Maintenance of the pontoon and access bridge for purposes of using the deck as a work area for marina related activities is entirely a non-Federal responsibility.

h. Marina Facilities (Non-Federal). Maintenance and replacement of the marina facilities is estimated to cost $69,000 annually.

TABLE 4-2

SUMMARY OF ESTIMATED PROJECT ANNUAL MAINTENANCE COSTS

Feature	Cost Per Event	Annual Cost 1/
1. Breakwaters (Federal)		
a. North Breakwater (yr 25) Replace 25% Armor Rock	$214,000	$2,500
b. East Breakwater (yr 25) Minor Repairs, Pontoon & Replace 15% Armor Rk E Breakwater	13,600	200
c. Fish Passage Opening (Every 5 yrs) Remove sand	5,000	800
d. Mitigation Monitoring		
Beach Inspection (yrs 3,5,8,10)	2,000	400
Clam survey (yr 5)	5,000	300
e. Contingency (15%)		600
f. Engineering & Design		600
g. Construction Management		400
TOTAL - FEDERAL ANNUAL MAINTENANCE COST		$6,000
2. Marina Facilities (Non-Federal)		Annual Cost
a. Moorage Basin Dredging (Every 5 yrs)	$30,000	$ 5,000
b. Floats, Utilities, Access Bridge		31,300
c. Contractor Overhead & Profit		3,600
d. Contingency (20%)		8,100
e. Engineering & Design		10,000
f. Construction Management		3,000
g. DNR Lease		8,000
TOTAL - NON-FEDERAL ANNUAL MAINTENANCE COST		$69,000

1/ 50-year project life, 8-1/4 percent interest rate.

4.17 Economics of the Recommended Plan.

a. General Methodology. The economic justification of the recommended plan is determined by comparing the average annual costs with average annual NED benefits which would be realized from the plan. A 50-year period of economic analysis was selected in analyzing the recommended project. Benefits and costs were based on October 1993 price levels. The first year of project operation was assumed to be 1996. The benefit determination assumed provision of 200 commercial moorage slips at the proposed Neah Bay marina. See appendix C for additional information on the economic analysis.

b. Benefit Methodology. Benefits were determined by comparison of the without-project condition with the with-project condition and calculating net benefits. The without-project condition includes those conditions resulting from the absence of yearround protected moorage at Neah Bay for commercial fishing vessels and lack of protection for the loading dock at the Makah fish processing facility. The with-project condition includes conditions resulting from construction of the proposed marina with breakwater protection for the moorage basin and fish loading dock. Benefits accrue primarily to the winter marine and salmon fisheries. The vessels involved were Indian and non-Indian trawlers, longliners, trollers, and non-Indian sea urchin vessels. The following benefit categories were identified for this project:

(1) Savings in Vessel Operating Costs Traveling from Port to Fishing Grounds. With protected winter moorage at Neah Bay, commercial fishermen would no longer have to navigate the extra miles from protected marinas at Sekiu and Port Angeles to the fishing grounds, which are near Neah Bay. Benefits are based on the number of trips per year, the miles saved per year, and the operating cost per mile, all computed for each vessel type.

(2) Savings in Vessel Operating Costs Traveling from Fishing grounds to Fish Processor. There is currently a marine fish processing facility in Neah Bay adjacent to the proposed marina site. During winter fishing season wave conditions in Neah Bay can be so severe that fishermen are forced to travel to protected harbors at Seattle, Bellingham, and Port Angeles in order to offload their catch. With breakwater protection at the proposed marina and fish dock, fishermen can safely offload at the Makah dock and save traveling extra miles. The savings were quantified by determining the type of benefiting vessels, the number of miles saved per year and the operating cost per mile per vessel type.

(3) Savings in Vessel Damages. Benefits are based on historical wave caused damages due to vessels moored or anchored in Neah Bay during the past 10 years. These damages would be eliminated with the proposed marina project.

(4) Reduced Dock Damages. Benefits are based on elimination of future wave caused damages to the loading dock at the Makah fish processing facility. Without-project conditions assume a severe storm every 10 years.

(5) Reduced Launching Costs. The proposed project would eliminate the need to retrieve and relaunch trollers to avoid wave caused damage they could incur if left in the water between fishing trips. The savings in launching costs was based on the number of trailered boats, the number of winter and spring launchings saved, and the cost per launching.

(6) Value of Time Saved. The value of time saved for categories (1) and (2) was based on an hourly rate equal to the value of leisure time or 1/3 the average per-hour wage rate for commercial fishermen. The wage rate was derived from the value of each fisherman's share and the cost of onboard meals for trawlers and used as proxy for all vessel types.

c. Summary of Project Benefits. A summary of average annual benefits which would accrue to this project is presented in table 4-3. Benefits are in October 1993 prices and have been annualized at 8 1/4 percent interest.

TABLE 4-3

SUMMARY OF AVERAGE ANNUAL BENEFITS
OCTOBER 1993 PRICES

Benefit Category	Average Annual Benefits
Transportation Savings	
Marina to Fishing Grounds	$367,000
Fishing Grounds to Fish Processor	176,000
Reduction in Vessel Damage	53,000
Reduction in Dock Damage	15,000
Savings in Vessel Launching Cost	35,000
Value of Time Saved	
Marina to Fishing Grounds	236,000
Fishing Grounds to Fish Processor	120,000
Total Benefits	$1,002,000

d. Project Costs. First costs of the Federal and non-Federal project's facilities are shown in table 4-4 and total $7,741,000, including non-creditable sponsor owned lands. Interest during construction was computed at 8 1/4 percent over a 6 month major construction period resulting in a project investment cost of $7,901,000. The investment cost was annualized over the 50-year project life at 8 1/4 percent and totals $664,000 per year. Annual operation and maintenance costs are estimated at $75,000 per year resulting in a total annual cost of $739,000. All costs are in October 1993 prices.

TABLE 4-4

NEAH BAY PROJECT FIRST COSTS, INVESTMENT COSTS, AND ANNUAL COSTS
(October 1993 Prices)

Project First Costs:	
Federal Project Costs	$4,090,000 1/
Non-Federal Associated Project Costs	3,651,000 2/
Total First Cost	$7,741,000
Interest During Construction (8 1/4 %, 6-Month Construction Period)	160,000
TOTAL INVESTMENT COST	**$7,901,000**

1/ Includes $49,000, value assigned to navig. servitude lands.
2/ Includes $41,000, value of lands already owned by sponsor.

Average Annual Costs:	
Interest and Amortization (50-Years at 8 1/4 Percent Interest)	$ 664,000
Operation, Maintenance and Replacements	
Federal Project	6,000
Non-Federal Project	69,000
TOTAL ANNUAL COST	**$ 739,000**

4.18 Benefit-Cost Analysis. Benefits and costs are in 1993 prices and have been annualized at 8 1/4 percent over the 50-year project life. Average annual benefits are $1,002,000; average annual costs are $739,000 yielding a benefit-cost ratio of 1.4 to 1. Net benefits total $263,000 per year.

4.19 Cost Sharing. The General Navigation Facilities ("Federal Project") are cost shared between the Federal Government and the local sponsor while 100 percent of the associated marina facilities ("Non-Federal Project") is paid for by the local sponsor. The local sponsor is the Makah Indian Tribe. Cost sharing allocation of the estimated full funded Federal Project construction costs was conducted in accordance with cost apportionment requirements of the Water Resources Development Act of 1986, Public Law 99-662 as amended. A project cooperation agreement (PCA) between the Department of the Army and the local sponsor will be signed to ensure cost sharing requirements are met. Cost sharing requirements are as follows:

a. Non-Federal Cost Sharing of the Federal Project Portion.

(1) The local sponsor shall provide at no cost to the Government all lands, easements, and rights-of-way, including borrow areas and dredged material disposal areas, and perform, or assure performance of, all alterations and relocations of facilities and utilities (except relocations or alterations of

(LERRD) determined by the Government to be necessary for construction, operation, or maintenance of the project.

(2) For commercial navigation projects, the local sponsor shall provide a cash contribution equal to ten percent of the costs attributable to the portion of the general navigation features of the project which has a depth not in excess of 20 feet. Since this project has less than a one-year construction period, these funds must be provided by the local sponsor to the Federal Government prior to construction contract award.

(3) The local sponsor, at his option, shall either repay, without interest, a lump sum at the end of construction and within 90 days of final accounting or repay in annual installments with interest over a period not to exceed 30 years following completion of the project or separable element thereof, an additional 10 percent of the total cost of the general navigation features allocated to commercial navigation minus a credit based on the value of LERRD associated with the Federal Project. The value of any lands, easements, and rights-of-way pertaining to the Federal Project but subject to navigation servitude are non-creditable and cannot be used as a credit towards repayment of the additional 10 percent. The computation of general navigation features costs and the credit allowed toward the additional 10 percent of the general navigation features cost is shown in table 4-5. All project costs have been full funded to the midpoint of construction in order to achieve a more realistic estimate of costs to be paid by the local sponsor.

TABLE 4-5

COMPUTATION OF GENERAL NAVIGATION COSTS AND ALLOWED CREDIT

Total Full Funded Federal Project Cost	$4,377,000
Less: Creditable LERRD	58,000 1/
Non-Creditable Marine Lands	51,000 2/
Navigation Aids	4,000
General Navigation Costs	$4,264,000 3/

Computation of Credit Allowed Toward Additional 10 Percent

LERRD $ 58,000 = 1.4 % of General Navigation Cost
Gen. Nav. $4,264,000

1/ Includes land value plus local sponsor LERRD activities.
2/ Economic value assigned to navigation servitude lands.
3/ Includes cost of Federal review & assistance for sponsor's LERRD activities.

b. Non-Federal Associated Marina Facilities. The local sponsor is responsible for constructing and paying for all associated marina facilities such as dredging and disposal of dredged material from the moorage basin, piers, floats, docks,

and mitigation associated with dredging the moorage basin. All of the associated marina facilities must be constructed during the construction period of October 1, 1995 through March 15, 1996. The full funded cost of the non-Federal portion of the project is estimated at $3,907,000 ($3,864,000 construction cost plus $43,000 for the value assigned to the marina lands). The project sponsor is also responsible for 100 percent of the operation, maintenance and replacement costs of this portion of the project. These annual costs are estimated at $75,000 in 1996 prices.

c. Total Non-Federal Cost Share. Based on the above full funded estimated project costs and computation of creditable LERRD, the project sponsor will receive a credit of 1.4 percent toward the additional 10 percent of Neah Bay general navigation costs. Total non-Federal cost responsibilities are therefore comprised of (1) creditable LERRD and non-creditable lands, (2) 18.6 percent of general navigation costs, and (3) 100 percent of the non-Federal portion of the project. Itemized non-Federal construction costs and annual operation, maintenance and replacement costs are shown in table 4-6.

TABLE 4-6

ITEMIZED NON-FEDERAL SHARE OF COSTS
ESTIMATED FULL FUNDED DOLLARS

Federal Project (Breakwater)

	Non-Federal Share Construction	
Costs - Federal Project	Cash	Non-Cash
Creditable LERRD		$58,000
Non-Creditable Marine Lands		51,000
Gen. Navigation-Upfront ($4,264,000 x 0.10)	$426,000	
Gen. Navigation-Repayment ($4,264,000 x 0.086)	367,000	
Sub-Total - Non-Federal Share	$793,000	$109,000

Non-Federal Project (Marina Facilities)

	Cash	Non-Cash
Construction Costs - Non-Federal Project		
Marina Lands		$43,000
Dredging, Disposal, Moorage Facilities	$3,864,000	
Sub-Total - Non-Federal Share	$3,864,000	$43,000
Grand Total - Non-Federal Share	**$4,657,000**	**$152,000**
Non-Federal Project Annual Operation, Maintenance and Replacement Costs (1996 Prices)		$75,000

The non-Federal share of the Federal Project costs consists of cash paid up front to the Federal Government, other cash required but not paid to the Government, i.e., LERRD, and sunk costs. Associated marina facilities consist of cash paid up front but not paid to the Government. Non-Federal costs by work item and type of funds are shown in table 4-6.

d. Federal Cost Share. Federal entities consist of the Corps of Engineers and the U.S. Coast Guard. The Corps of Engineers will pay for 81.4 percent (considering local sponsor LERRD credit of 1.4 percent) of the costs of the general navigation facilities (GNF) which consist of the breakwaters and associated mitigation (removal of Evans mole) and the Federal channel. Any construction costs over the $4 million Federal cost share limit are the responsibility of local interests. The Corps will take responsibility for operation and maintenance (O&M) of the GNF. However, current policy dictates that the Government's responsibility for O&M shall cease when the Government's expenditures for O&M of the GNF have reached the greater of $4,500,000, less the Government's share of the construction costs of the GNF, including all planning study costs; or 125 percent of the Government's share of the construction costs of the GNF, including all planning study costs. The U.S. Coast Guard will pay for construction and maintenance of the aids to navigation.

At the time of construction the Corps of Engineers would provide 90 percent of the $4,264,000 cost of the GNF less $4,000 navigation aids or $3,838,000. The local sponsor would reimburse the Government for 8.6 percent of the total cost of the GNF or $367,000 (10 percent of the total GNF cost less local sponsor credit for providing certain creditable lands). The net Federal construction cost share would then be $3,471,000 by the Corps of Engineers and $4,000 by USCG for navigation aids.

4.20 Local Sponsor Assurances. Required local sponsor requirements are summarized in section 6 (Recommendations) of this report. The Makah Indian Tribe, as local sponsor of the channel deepening project, has furnished formal assurance that they possess the legal and financial authority and capability, under applicable Federal authority and other laws, to assume the non-Federal responsibilities for the proposed project.

4.21 Financial Analysis. The purpose of the financial analysis is to help ensure that the non-Federal sponsor understands the financial commitment involved and has a reasonable plan for meeting that commitment. A financial analysis consists of: (1) the non-Federal sponsor's statement of financial capability, (2) the local sponsor's financing plan, and (3) the Corps of Engineers assessment of the local sponsor's financial capability. All project costs have been full funded to the mid-point of construction in order to achieve a more realistic estimate of costs to be paid by the local sponsor.

a. Statement of Financial Capability. The Makah Indian Tribe's statement of financial capability is presented as exhibit A on the following page. (To be enclosed in final report.)

b. Financing Plan. The local sponsor's financing plan is presented as exhibit B and follows exhibit A.

c. Assessment of Financial Capability. (to be completed).

SECTION 5. COORDINATION

5.01 Coordination Framework.

a. General. Coordination was accomplished during the study with Federal, state, and local agencies through meetings, telephone calls, and correspondence. Coordination on a navigation project at Neah Bay began in 1983 and continued through 1988 as part of the Northern Olympic Peninsula Shallow Draft Navigation study. The concerned agencies participated in the scoping of baseline environmental studies to be used to evaluate impacts of the project on resources at Neah Bay. Several of these baseline studies were carried out and the reports provide the information for environmental assessment under the current Section 107 study. Additional coordination for this study was begun in January 1990 and included meetings with the local sponsor and four interagency meetings held on December 4, 1990, December 12, 1991, March 27, 1992 and November 24, 1992 to scope additional studies specific to the central bay project site. An interagency site visit was held on January 20-22, 1993 to do mitigation planning and resulted in the mitigation measures for the project. One planning aid letter and a Fish and Wildlife Coordination Act report were solicited from the U.S. Fish and Wildlife Service. Although Neah Bay is outside the PSDDA area, a plan for sampling the proposed dredged sediments was coordinated with the PSDDA agencies to provide guidance for proper testing of material to be dredged. In May 1993 the Corps of Engineers contractor executed the sampling plan. Upon review of the resulting chemical analyses, the agencies agreed that the proposed dredged material is suitable for openwater disposal.

b. Public Information Meetings. On , 1993, the local sponsor, the Makah Indian Tribe, and the Seattle District Corps of Engineers held a public information meeting at Neah Bay, Washington. (Report on public meeting). On , 1993, another public information meeting was held in as part of the Public and Agency Review of the Draft Definite Project Report/Environmental Assessment. (Report on meeting)

5.02 Coordination with Key Agencies.

a. Makah Tribal Council, Makah Indian Nation, Local Sponsor. Extensive coordination has been maintained with the Makah Tribal Council and planning staff in developing the recommended plan. Coordination for this Section 107 study began during the reconnaissance study in March 1990 and continued throughout the feasibility study. Three plan formulation meetings with the tribal staff and Corps engineering staff were held on September 17-18, 1992 and November 9, 1992, and April 8, 1993 to decide on the breakwater alternatives to study, evaluate the inclusion of pontoons into a rubblemound concept, and review the relative costs. The Tribal Council then directed that final design focus on the rubblemound breakwater/one pontoon variation

(Recommended Plan). The Tribe participated in all environmental coordination meetings and in the mitigation planning site visit and subsequent negotiation of the mitigation plan. See appendix B, part 2, Makah Tribal Council coordination letters on design dated December 21, 1992, and February 8, 1993). The Makah Tribe has agreed to provide the local cooperation requirements as reflected in their letter dated (see appendix B, part 2).

b. National Marine Fisheries Service (NMFS). NMFS participated in the 1984 scoping of environmental baseline studies including marine fish studies and the marine mammals study. NMFS provided a letter of guidance for scoping the additional baseline studies for this Section 107 study. Fisheries concerns expressed in the interagency meetings and mitigation planning were coordinated with NMFS.

c. U.S. Fish and Wildlife Service (FWS). FWS participated in the scoping of the original baseline environmental studies for the Shallow Draft Navigation study (1984) and in the scoping of the additional baseline studies for this Section 107 study (1992). FWS attended all the interagency meetings, prepared a planning aid letter dated March 26, 1992, and helped develop the project mitigation plan. FWS coordinated resource agency concerns during preparation of the draft and final Fish and Wildlife Coordination Act (FWCA) Reports. The draft report, which includes planning recommendations, is found in appendix B, part 3. Corps of Engineers responses to the recommendations are found in appendix B, part 3, immediately following the FWCA report.

d. U.S. Environmental Protection Agency, Region 10 (EPA). EPA participated in the scoping of the baseline environmental studies (1984) and of the additional baseline studies for this Section 107 study (1992). EPA participated in two interagency meetings, provided a letter of guidance, and participated in mitigation planning and in the scoping of sediment testing and evaluation of sediments for openwater disposal.

e. U.S. Coast Guard (USCG). Draft DPR/EA was provided to USCG in November 1993.

f. State of Washington, Department of Ecology (WDE). WDE participated in the scoping of the baseline environmental studies (1984) and of the additional baseline studies for this Section 107 study (1992). WDE participated in three interagency meetings, in mitigation planning, and in the scoping of sediment testing and evaluation of sediments for openwater disposal.

g. State of Washington, Department of Fisheries (WDF). WDF participated in the scoping of the baseline environmental studies (1984) and of the additional baseline studies for this Section 107 study (1992). WDF participated in three interagency meetings and subsequent mitigation planning.

h. State of Washington, Department of Natural Resources (DNR). DPR/EA was provided to DNR in December 1993.

i. State of Washington, Office of Archaeology and Historic Preservation (SHPO). See appendix B, part 2, for coordination with SHPO.

j. State of Washington, Department of Wildlife (WDWL). WDWL participated in the scoping of the baseline environmental studies (1984) and attended the initial Section 107 interagency meeting. Minutes of subsequent meetings have been provided to WDWL.

k. Clallam County Planning Department (Clallam County). Draft DPR/EA was provided to Clallam County in December 1993.

5.03 Coordination of Draft Report. The draft DPR/EA was distributed for a 30-day public and agency review in December 1993 to 50 agencies and organizations. See appendix B, part 1 for a summary of the draft DPR/EA mailing list. ( ) letters of comment were received from the public and agencies. These letters and the Corps of Engineers responses are found in appendix B, part 4.

SECTION 6. RECOMMENDATIONS

6.01 I recommend the construction of a small boat harbor at Neah Bay, Washington, consisting of two breakwaters, a navigation entrance channel, and other features in accordance with the recommended plan described in this report, with such modification thereof as in the discretion of the Commander, HQUSACE, may be advisable. The estimated full funded cost sharing plan total is $8,190,000 for construction and $82,000 annually (1996 prices) for maintenance. Authorization is subject to cost sharing and financing requirements as contained in Pulic Law 99-662, November 1986. Prior to construction and during preparation of plans and specifications, the local sponsor would sign a project cooperation agreement with the Seattle District Corps of Engineers. The local sponsor shall:

a. provide all lands, easements, and rights-of-way, including borrow areas and dredged material disposal areas, required for construction and subsequent maintenance of the project as well as all necessary retaining dikes, wasteweirs, and stilling basins;

b. accomplish without cost to the United States all alterations and relocations of structures necessary for construction, operation, or maintenance of the project;

c. perform all utility relocations or alterations determined by the United States to be necessary for construction, operation, or maintenance of the project;

d. hold and save the United States free from all damages arising from the construction, operation, and maintenance of the project, except for damages due to the fault or negligence of the United States or its contractors;

e. provide and maintain without cost to the United States adequate berthing areas with depths commensurate with those in the Federal improvements, and necessary mooring facilities, utilities, and a public landing with suitable water supply and essential sanitary facilities, parking area, a boat launching ramp, and access roads open to all on equal terms.

The net cost (after reimbursement) to the Federal Government for construction of the recommended breakwater project is estimated at $3,475,000.

Date: _____

Walter J. Cunningham
Colonel, Corps of Engineers
District Engineer

ENVIRONMENTAL ASSESSMENT

DRAFT ENVIRONMENTAL ASSESSMENT
NEAH BAY MARINA
NEAH BAY, WASHINGTON

1. Introduction. The Makah Indian Tribe has requested that the Seattle District, U.S. Army Corps of Engineers, under Section 107 of the River and Harbor Act of 1960 (as amended), assist in constructing a small public boat basin at Neah Bay on the Makah Indian Reservation waterfront shoreline. The need for a protected marina at Neah Bay results from the changing scope of the commercial Indian and non-Indian fishery, from a one season, one species activity to a multi-species, year-round fishery. If winter wave protection at Neah Bay were available, both Tribal and non-Indian commercial fishermen would be able to avoid hours of travel time to fishing grounds from their existing safe moorage, e.g., Port Angeles and Port Townsend. In addition, a protected harbor would block wave action which was responsible for destroying or severely damaging 14 boats at Neah Bay in 1983, sinking 8 boats in 1988, two boats in 1989 and three in 1992. The proposed project features would also offer a safe harbor of refuge for vessels and increase employment opportunities in an economically depressed region.

2. Proposed Action. The preliminary project plan is to develop a commercial marina along the central portion of the south shore of Neah Bay. The marina could accommodate an estimated 200 boats and would be dredged to a depth of 15 feet below mean lower low water (MLLW). A 350-foot-long by 59-foot-wide concrete bridge pontoon (part of the former I-90 bridge across Lake Washington) would be grounded on the intertidal beach to protect the eastern side of the marina from the larger ocean waves. A 1,450-foot-long rock breakwater would protect the northern and part of the eastern side from ocean waves and waves generated within the bay. The northern breakwater would be constructed to +18 feet MLLW. A 50-foot opening would remain between the north breakwater and the pontoon to allow for fish passage and increase flushing of the moorage basin. Approximately 50,000 cubic yards (cy) of sand would be dredged for the moorage basin, of which about 14,000 cy would be used as core material in placing the pontoon and 6,000 cy placed around the pontoon. Alternatives for disposal of the remaining 30,000 cy of dredged material include placement of it in the adjacent eroded beach for improved clam habitat for mitigation or placing it at an upland site.

The Makah Indian Tribe would provide all remaining project features, including moorage facilities, utilities and parking. Miscellaneous marina-related facilities to be provided by the Tribe would include floats, ramps, pilings, walkways, sewage pump-out facilities, utilities, and related marina support facilities. The layout of floats and ramps will be designed by the Makah Tribe, based on the expressed needs of the fisherman.

3. Need for the Action. Fishing, forestry and tourism are the principal industries of the Makah Indian Tribe. Fishing grounds in the vicinity of Neah Bay are among the richest and most productive in Washington state. Neah Bay's location advantage, however, also subjects the area to severe weather conditions. During stormy weather, waves on the Strait of Juan de Fuca can exceed 20 feet in height and although mostly confined to the winter months, can occur throughout the year. Neah Bay receives some wave protection from the existing breakwater; however, wind-generated waves out of the northeast cause significant wave action throughout the bay. Twenty-two boats have been severely damaged or destroyed since 1983 due to this wave action. The Indian and non-Indian commercial fishery is now a multi-species, year-around activity. If winter wave protection at Neah Bay were

available, both tribal and non-Indian commercial fishermen would be able to avoid hours of additional travel time and costs from their existing winter moorage at harbors east of Neah Bay.

4. Affected Environment.

a. Vegetation. Sand provides the main substrate within the project area, except for some riprap on the upland side. Sand does not provide a favorable substrate for plant growth because it tends to shift throughout the year with tide, current and weather changes and lacks a sizeable surface for plant attachment. Plant diversity within the project area is low. The most abundant species are Fauchea sp., followed by sea lettuce (Ulva sp.), Laminaria saccharina, Enteromorpha intestinalis, Gracilaria pacifica and Egregia menziesii. Fauchea sp. and Ulva sp. were found in half of the project site and the other species are quite patchy in their distribution. No eelgrass was observed within or adjacent to the project area.

b. Invertebrate Fauna. The most productive clam beds are found on the west edge and immediately east of the project area. Horse clams (Tresus capex) are the most abundant, followed by Macoma, the heart cockle (Clinocardium nuttali), butter clam (Saxidomus giganteus), littleneck clam (Protothaca staminea), geoduck (Panopea generosa) and Tellina modesta. Horse clams are harvested by tribal members for subsistence living. There are no commercial beds of geoducks within the bay and only two were observed during a one week subtidal survey (using SCUBA) of the project area (Shreffler 1992). Dungeness crabs (Cancer magister) are found throughout the bay with increased densities from March to September, presumably from settlement and or recruitment into the bay (Simenstad et al., 1988). Harvests are made by tribal members for subsistence living. Sea urchins are not located within the bay, but significant populations may be located outside of the bay. Red rock crabs (Cancer productus) and various shrimp species were observed during the Battelle 1992 study, mostly at the west end of the project area by the floating docks. They are probably attracted to the large amount of fish waste below the docks.

c. Fish. Productive areas for fish are at the west end of the bay (U.S. Fish and Wildlife Service and Makah Tribe, 1985) and at Baadah Point (Simenstad et al., 1988). The most abundant marine species in the bay are starry flounder (Platichthys stellatus), kelp greenling (Hexagrammos decagrammus), pacific staghorn sculpin (Leptocottus armatus), sandlance (Ammodytes hexapterus), surf smelt (Hypomesus pretiosus pretiosus) and pacific herring (Clupea harengus pallasi). Flatfish and sculpin species were the most frequently observed fish in the 1992 Battelle on-site subtidal study, but their numbers were minimal (Shreffler, 1993a). No sandlance or surf smelt eggs were found on project site substrate during a January to June study (Shreffler, 1993a). Juvenile salmon use of the bay is not well known, but was monitored by Battelle during the spring outmigration period, March - June, 1993. Juvenile chum salmon were the only salmonid species captured in beach or purse seins with the exception of one, age 1+ chinook. Small numbers of salmonids were caught in the USFWS and Makah Tribe 1985 study, with the largest numbers at the west end of the bay. The 1985 study was duplicated in Clallam Bay, which was found to have more salmonid use than Neah Bay. Commercial and tribal fish catches from 1989 - 1991 in the Strait of Juan de Fuca near Clallam Bay and west and south to the Queets River consisted primarily of rockfish, flounder, cod, sablefish (Anoplopoma fimbria), sole and some salmon. Sport fishing in Neah Bay consists mostly of salmon fishing, although there is also fishing from piers for various marine species, especially pile perch.

d. Birds Use of the project area by waterfowl and other species of marine birds occurs during spring and fall overwintering migration. Data collected by Chapman (1993) shows that during 1992,

there were never more than a total of 75 ducks observed in Neah Bay at any one time. The most visible birds in the project area are scaups, scoters, buffleheads (Bucephala albeola), gulls and cormorants. Black turnstones (Arenaria melanocephala) also winter in the area. During the spring and summer, several species nest on offshore rocks and islands, such as gulls, cormorants, puffins, auklets and the storm petrels (Oceanodroma spp). These species fan out from their nest sites to feed varying distances away, and some may feed in Neah and Clallam Bays. Some species such as auklets are primarily nocturnal and are not easily observed in their feeding habitats. Primary nesting areas appear to be at Tatoosh Island and Sail and Seal Rocks. Waadah Island may support nests as well. Approximately 50 species of water-dependent birds utilize the project areas during the course of the year.

e. Marine Mammals. Twenty-one species of marine mammals (pinnipeds and cetaceans) inhabit the Strait of Juan de Fuca. Nine of these are listed as common; the remainder are rare or only known from old records. The common species include the river otter (Lutra canadensis), California sea lion (Zalophus californianus californianus), northern sea lion (Eumetopias jubatus), harbor seal (Phoca vitulina), gray whale (Eschrichtius robustus), minke whale (Balaenoptera acutorostrato), killer whale (Orcinus orca), harbor porpoise (Phoceoena phocoena), and Dalls porpoise (Phocoenoides dalli). Of these, the only species considered to be of regular occurrence in the study vicinity are the river otter, gray whale, and killer whale. Tatoosh Island is considered to be a minor haul out area for both California and northern sea lions, and Seal Rock and Tatoosh Island have been known on rare occasions to be haul out areas for a small number of harbor seals.

f. Threatened and Endangered Species. The bald eagle and northern sea lion are listed as threatened, and the peregrine falcon and marbled murrelet are listed as endangered on the Federal list of endangered and threatened wildlife and plants. The bald eagle (Haliaeetus leucocephalus) and peregrine falcon (Falco peregrinus) both nest and feed in and around the Olympic Peninsula, and all are present throughout the year. In addition, the northern sea lion (Eumatopias jubatus) frequents the waters near Neah Bay. The marbled murrelet (Brachyramphus maniculata) is rarely seen in the vicinity of Neah Bay. A survey of nesting marbled murrelets was conducted in spring and summer of 1992 in the old growth forests near Neah Bay; no evidence of marbled murrelet nesting was found. The survey will be repeated in 1993 (Chapman, 1993). Between 6 and 8 adults were observed on three consecutive days in June, 1993 within the bay; the birds were adjacent to Waadah Island and the breakwater, and never came near the project area (Chapman, 1993). The birds were attracted to the large prey concentration in the area at the time, which also attracted large numbers of rhinocerous auklets and common murres (Chapman, 1993).

g. Water Quality. Water quality in the project area is classified as "extra-ordinary" (AA, highest classification) by the State of Washington, with standards providing a full range of human and environmental uses and allowing a minimum of impact due to human activity or discharges.

h. Sediment Quality. In November 1986, Battelle Northwest sampled two areas in Neah Bay for Seattle District. A total of twelve sediment samples were taken, half at the Crown Zellerbach site and half at the beach west of Evans Mole. Each sample was taken using a 0.1 m^2 modified Van Veen grab sampler which sampled to a depth of approximately 10 cm. Samples were analyzed by Battelle for metals, sediment toxicity and organics. The samples from the Crown Zellerbach site had one Puget Sound Dredged Disposal Analysis (PSDDA) screening level (SL) exceedance for zinc and six marginal detection exceedances. The results from the Evans Mole site were all below PSDDA SLs, except one marginal detection exceedance of 1, 2, 4-trichlorobenzene.

During the planning stage of this project, resource agencies suggested dredge material be chemically tested to insure against contamination at the disposal site. PSDDA criteria was used because it is currently the best guidance available for dredged material, even though it is only required for dredged material that will be disposed at an open-water site within Puget Sound. In May 1993, Seattle District took four samples within the dredging area of the proposed marina. Depths ranged from 2.5 to 11 feet and the cores were composited for one PSDDA analysis. The one composite was tested for organics, chlorinated hydrocarbons, phthalates, phenols, volatile organics, pesticides and PCB's. The results found the composite below all PSDDA SL's, thus the material is suitable for open-water disposal. Reference the Memorandum for Record at the end of this EA, that discusses the suitability of this material for beach nourishment. Previous log shipping activities at Neah Bay have resulted in wood deposits in bay sediments, especially at the Crown Zellerbach site.

i. Air Quality/Noise. Air Quality in the vicinity of Neah Bay is generally excellent with minor effects from vehicles, vessels and particulate emissions from fires. Noise levels are relatively low, indicative of the rural nature of the area.

j. Cultural Resources. Neah Bay is the current tribal center for the Makah Indian Nation. In the past, Neah Bay contained two ethnographically reported villages: Neah and Baadah. Neah village was located at the west end of the bay contiguous with the contemporary town of Neah Bay. Baadah, the larger of the two villages was located near Baadah Point to the east of the boat harbor site. The suspected location of Baadah village is at the mouth of Agency Creek. This is east of the boat harbor site. Landfilling in the vicinity of Baadah Point has obscured the original surface and has made surface reconnaissance nearly impossible. Test excavations within the project area tidal zone did not yield evidence for an archeological site.

5. Marina Site Alternatives. In 1986, the Tribe and the Corps reviewed the bay for marina site locations. Three sites were examined; Baadah Point, Evans Mole and Crown Zellerbach. Baadah Point was not selected because of its high biological productivity, Evans Mole was not selected because of lack of uplands for marina facilities nearby and Crown Zellerbach was not selected because there were no upland facilities and it would have been too costly to construct a road and bring in power lines to the marina. The present project site is located between the Bayview Cafe and the Far West Resort, which is in the central area of the south shore of the bay. Adjacent to the project site are the uplands that are designated for marina parking. See section 3.06 (b) of the main report for more information.

6. Final Marina Design Alternatives.

a. No Action. If the marina is not improved and enlarged, fishing vessels that seek refuge in Neah Bay in stormy weather will continue to incur damage and some will be run ashore or grounded from time to time. Tribal fishermen will continue to commute from their homes in Neah Bay to Port Angeles, living there temporarily, in order to service, oversee and load their boats while moored there. This practice is expensive, inconvenient, inefficient and sometimes hazardous due to icy road conditions. The existing moorage at Neah Bay would continue to be used in the summer and early fall season mostly by recreational fishing craft, particularly trailerable boats.

b. Variation 2. Reference Appendix D, variation 2. See also figure 3-2, Final Breakwater Variations, in the main report. Variation 2 utilizes a 350-foot-long by 59-foot-wide by 16-foot-high concrete pontoon salvaged from the Interstate-90 (Lake Washington) floating bridge to construct the

east breakwater. The pontoon would be moved into place and grounded at high tide, then ballasted with sand or gravel to fix it in place. Between the north breakwater's beginning at station 5+00 to a point slightly beyond its dog-leg there would be a rubblemound structure with a top elevation of +18 feet MLLW. From station 9+60 to the end of the breakwater (station 19+30), steel piling and concrete panels would extend for the full 40-foot height of the structure. Spacing between piles would be 4 feet and each pile would require a batter pile for lateral bracing. The footprint of the north breakwater pile section is negligible, while its dog-leg is 1.3 acres, which is less than the preferred alternative, variation 3. The pontoon would cover 0.5 acre as in the preferred alternative. While the footprint of variation 2 is 3.1 acres smaller than the preferred alternative, the concrete panels would offer an inferior substrate and less surface area for attachment by macroalgae and invertebrates than a breakwater made entirely of rock as in the preferred alternative.

c. Variation 3 (Preferred Alternative). Reference Appendix D, variation 3. This alternative would incorporate one pontoon for the east breakwater and a rubblemound breakwater for the north breakwater with a top elevation of +18 feet MLLW (see plate 1). There would be a 50-foot opening between the two breakwaters on the east side to allow better flushing and shallow water fish passage through the marina. Dredging for the marina would start below the -2 foot MLLW contour line and the depth of dredging would be to -15 feet. The 50,000 cy of dredged material would be incorporated within the project and its mitigation. Approximately 14,000 cy would be necessary for ballasting the pontoon and 6,000 cy would be placed over the quarry spalls that surround the pontoon. The remaining 30,000 cy would be disposed at the eroded beach site adjacent to the pontoon. First a temporary disposal dike would be constructed to allow dredged material to dewater. After all the sediment is dewatered, it would be smoothed out to meet the natural coastline and cover the crevices among the quarry spalls to decrease juvenile salmonid fish predator habitat. The footprint of the north breakwater and dog-leg is 4.4 acres and 0.5 acres for the pontoon.

d. Variation 4. Reference Appendix D, variation 4. This variation is identical to variation 3 (the preferred alternative described above) except that the pontoon for the east breakwater would be replaced by a rubblemound breakwater. The footprint for the north breakwater and dog-leg is 4.4 acres and the east breakwater is 0.5 acres. The environmental impact is the same as the preferred alternative because both east breakwater alternatives would provide the same substrate to surround the breakwater - armor rock and quarry spalls.

7. Environmental Consequences of the Proposed Action.

a. Vegetation. Most of the project area is bare substrate with minimal cover by macroalgae and thus the breakwater construction and pontoon placement would have minimal impact on existing flora found along the proposed alignment. Shading of flora would be increased with the addition of the breakwater and marina floats, but this impact is minimal because of the lack of flora found in the project area. Dredging would also remove any flora that is within the dredging area. Rock used for construction would provide a substrate for colonization by plant species adapted to rocky habitats. Plant colonization on the inner side of the breakwater could be slowed by reduced circulation, increased turbidity, boat discharges and harbor activity. These factors along with the increase of rocky substrate may encourage growth of different species.

b. Invertebrate Fauna. Breakwater construction and placement of the pontoon would bury sessile benthos, primarily bivalves and polychaetes. Invertebrate species typically found on rocky habitats in the Strait of Juan de Fuca would be expected to colonize the new rock, creating a

community similar to that of the existing breakwater between Baadah Island and the mainland. Dredging would also remove sessile benthos, but it is anticipated that in time populations would recolonize the area at appropriate elevations assuming similar conditions were present, especially substrate type. Mobile organisms, e.g., crabs, should be less impacted because many are able to avoid or escape from the construction area. Nevertheless, many mobile organisms will suffer mortality. It is expected that the new recolonized communities will be altered in terms of diversity, species abundance and production, compared to preconstruction communities. This alteration is anticipated because of the potential for change in the water quality and the increase in rocky substrate from the breakwater construction.

c. Fish. Construction of the breakwater would result in replacement of one type of aquatic habitat by another. A portion of the breakwater sideslopes are expected to provide new habitat for rockfish species, which could result in increased predation on juvenile salmonids. Some intertidal habitat would be lost from dredging and deeper habitat created. However, shallow water passage through the marina for juvenile salmon migrants would be maintained by the marina design, which limits dredging to areas below -2 feet MLLW and by the fish passage opening between breakwaters.

d. Birds. The boat basin would increase commercial and recreational boating in the area during the winter months, potentially disturbing small numbers of wintering water birds. The marina breakwater would reduce benthos populations now used by birds, but would provide other kinds of habitat (breakwaters) for other organisms that could provide food for birds. Water quality within the moorage basin may be slightly degraded and could impact birds such as waterfowl and diving birds. Impacts to birds are not considered to be significant.

e. Marine Mammals. Construction of the boat basin is not expected to significantly affect marine mammals. Placement of the breakwater would provide habitat for different species of marine life which could serve as an additional food source for marine mammals. Increased activities from commercial and recreational boaters in the winter could disrupt marine mammal usage patterns in Neah Bay and nearby areas; some species such as the California and northern sea lion occasionally are attracted to fishing boats and fishing activity and are a nuisance to fishermen.

f. Threatened and Endangered Species.

(1) Bald Eagles. The project area is close to existing regular charter and commercial boat activity and will have the effect of consolidating several temporary summer wharves into a single year-round permanent marina. Human activity should increase slightly over current levels, primarily during the winter. The fact that five pairs of bald eagles nest within four miles of Neah Bay, and that they regularly perch on city streets, and on pilings close to human activity, suggests that these birds are accustomed to human activity.

The food web would be minimally disrupted by loss of invertebrates due to dredging as well as by construction of the breakwater and the marina. The effect on the bald eagle prey base is expected to be relatively small compared to the total biomass within Neah Bay and the small numbers of eagles utilizing the bay for feeding habitat. Loss of approximately 10 to 20 acres of surface water (primarily due to construction of the small boat basin and breakwater) would not be expected to have an effect on bald eagles, based on literature and on observations of researchers that aquatic bird use in Neah Bay is relatively low. For several years, bald eagles have perched on pilings close to the Makah Indian Fish Company dock to eat the fish waste that is discarded into the bay. Over the past two years, the

Tribe and resort operators have agreed to dump their fish waste into the middle of the north end of Neah Bay (Chapman, 1993). This has had the effect of reduced use of the pilings by bald eagles (Chapman, 1993). With construction of the new marina, the pilings used by eagles would not be affected, and the policy of discharging fish waste in the middle of Neah Bay would continue. Thus, the marina is not expected to affect current bald eagle feeding behavior.

(2) Peregrine Falcons. At least one nest of peregrine falcons exists within five miles of Neah Bay. The proposed project would not affect the nest site(s), nor would it affect the nesting pair(s), since these birds feed along the outer coast. Migrant peregrines and a few that winter in the region do feed in and around Neah Bay (Anderson, 1983; Byrne, (in Chapman, 1993a)), though this appears to be a rare event. Chapman (1993b) never observed a peregrine falcon during her year of surveys at Neah Bay.

In addition to a small loss of prey habitat and prey base, the marina would deter peregrines from feeding nearby (Anderson, 1984). Peregrines do not adjust well to human activity. Anderson (1984) found the closest he could approach a peregrine falcon in Lummi Bay was 150 yards. Peregrine falcons tend to feed around dawn and after dusk, hours when fishermen are most active. And because the marina will be a permanent facility, fishing activity during the winter season may increase. Thus, peregrine encounters with fishermen may be more likely during the winter than they are now. Such encounters may be expected to adversely affect peregrine success at prey capture. However, due to the rarity of peregrine sightings in Neah Bay, and the even rarer feeding activity by peregrines in Neah Bay, the impact of increased human activity is not expected to be significant.

No hunting or feeding perches, or night roosts of peregrines are known in the Neah Bay vicinity, although they likely exist. The proposed project would not be expected to directly disturb any perches or roosts due to their distance from the project (such as on the existing breakwater or Waadah Island).

(3) Marbled Murrelet. Since marbled murrelets are seldom encountered in Neah Bay (only when large prey concentrations are present, which is rare), the marina is not expected to impact this species. A potential concern is with the gill net fishery, which has been shown to be a significant cause of marbled murrelet mortality in some areas. Marbled murrelets are seldom encountered in the Strait of Juan de Fuca, though they are common along the coast (Chapman 1993). Further, the gill net fishery does not occur where marbled murrelets are common (Chapman 1993). According to Bill Simons, Makah Tribal Planner (1993), the gill net fishery will not increase (that is, there will not be an increase in the number of gill nets) following construction of the marina, since the total take is restricted. In addition, the expectation is that Neah Bay gill net fishing will decrease in coming years. Thus, impacts to marbled murrelets resulting from the marina construction or from gill net fishing are not expected to be significant.

(4) Northern Sea Lion. The infrequency of occurrence near Neah Bay, especially during the construction period, suggests that northern sea lions would not be affected by construction of the Neah Bay marina. Some Makah tribal fishermen are concerned that sea lions will become a regular nuisance once a year-round marina is in operation.

g. Water Quality. Dredging and dredged material disposal would result in temporary decreases in water quality, particularly due to increased suspended solids. Vessel discharges (primarily of accidental domestic wastes and petroleum hydrocarbons) would degrade water quality in the marina, but flushing due to marina design and strong tidal and current actions would render the degradations

temporary and non-significant. There could be an increase in tributyltin (TBT) from antifouling paints with the increase in boat moorage, specifically from larger vessels (82 feet and larger) which legally can still use paints containing TBT. Due to the limited use of this paint type and to expected good flushing, this is not expected to cause a significant water quality problem.

h. Sediment Quality. Sediments within marinas generally have increases in TBT, copper, lead and zinc (Crecelius et al. 1990) and these contaminants can exist out to 150 feet from marina entrances. Although these heavy metals would be found in marina sediment, their concentrations are not expected to be significant based on the Crecelius report. The report, which studied two northwest marinas, found heavy metals within marina sediments to be above PSDDA SL's, but usually below the lowest apparent effect threshold (AET). The AET value indicates the concentration of a chemical above which toxic effects have always occurred and below this value there is no biological effect.

i. Air Quality. There will be a temporary and localized reduction in air quality due to emissions from the operating equipment. This effect is regarded as negligible.

j. Cultural Resources. No impacts to cultural resources are anticipated as a result of this project. Construction of the haul road for the rock breakwater follows an existing roadbed to the water. In the water, the haul road will become the project breakwater. No cultural materials were encountered in these locations.

k. Coastal Zone Management Act (Federal) and Shoreline Management Act (State of Washington). The Makah Tribe has a coastal zone management program that was developed in 1980, updated in 1993, and is consistent with the state's Coastal Zone Management Act. Based on past permit actions and documentation by the Bureau of Indian Affairs, the Corps has determined the boundary between state bedlands and reservation lands to be extreme low water, presently established at -3.8 feet MLLW, with the reservation landward of this line. Approximately half of the marina project is in state lands. The project is consistent to the maximum extent practicable with the enforceable policies of the applicable approved State and Tribal management programs.

8. Mitigation Alternatives.

a. Preferred Mitigation Plan.

1) Mitigation within Marina Design - The marina design has been revised several times to incorporate fisheries concerns. Rather than making the breakwater a continuous structure, the north and east breakwaters were separated by a 50-foot opening to allow for fish passage and facilitate better flushing for the moorage basin. Moorage floats have been rearranged to take advantage of deeper water, which would also require constructing the north breakwater in deeper water. This would necessitate less dredging, but would significantly increase construction costs of the north breakwater. As a result, dredging would start below the -2 foot MLLW contour and the +2 to -2 foot MLLW band would be preserved, as suggested by USFWS and WDF because of the invertebrate productivity in that area. With the marina in deeper water, dredging would decrease from 147,000 cys to 50,000 cy and total dredging acreage reduced from 11.4 acres to 5 acres. Plus, three acres of the low intertidal (+2 to -2 foot MLLW) would be preserved. To minimize juvenile salmonid predator habitat, a sand blanket would be placed around the pontoon to fill rock crevices that could hide fish that prey on juvenile salmonids. The pontoon would have a 1v on 5h slope to the west and a natural slope (ca. 1v on 10h) on the east side from this deposited sediment. This slope and sandy substrate would provide

low intertidal passage around the pontoon with limited predator habitat. The low intertidal fish passage band would continue through the marina. The north breakwater's dog-leg would be located in deeper waters, not disturbing the biologically productive band of the low intertidal.

2) North Breakwater Substrate Creation - The north breakwater covers deep water habitat, which was found unproductive by the 1992 subtidal surveys. Covered habitat will be compensated for by the created rocky substrate of the breakwater. Macroalgae, including Fucus, Agarum, Laminaria and Nereocystis could inhabit the new breakwater.

3) Evans Mole Removal/Adjacent Beach Feed - Evans Mole would be completely removed to the +14 foot MLLW contour (0.5 acres) to mitigate for the 0.5 acres of intertidal coverage by the pontoon. The 0.1 acre of lost intertidal mudflat, shading from the docks and the impact on water quality from the marina, will be mitigated for in a combination of ways. First, with the removal of Evans Mole, sediment will be allowed to reenter the littoral system west of Evans Mole, as it did in the early 1960's, before the mole was built. Dredged material will be placed at the eroded beach site, thus accelerating the restoration of intertidal habitat by providing an initial steepening of the eroded beach and an initial pool of sediments to be sorted over the beach by wave action leaving the coarser material. This habitat should be of better quality for clams because of the larger grain size. If the mole is not removed, the +2 foot to -2 foot MLLW foreshore of the beach between the pontoon and Evans Mole will erode away producing a beach largely at -3 feet MLLW. In ten or more years, depending on the frequency of high tide storms, the beach should be restored to its pre-Evans Mole profile and productivity.

4) Monitoring - At year three, five, eight and ten the Corps will review current aerial photos or conduct a site visit to track the success of sediment movement towards the pontoon. At year five the Corps will perform a clam survey within the mitigation site and at the beach east of Evans Mole to determine the extent of the clam beds as well as the species mix, size distribution and densities. This survey would be similar to the clam survey that was performed by the Corps in August 1992, except that the parallel transects would be every 40 meters instead of every 20 meters. The Corps and the local sponsor will track the progress of clam habitat restoration through year ten and report the findings to the appropriate resource agencies. If the beach is not measurably restored by year ten to its pre-Evans Mole productivity, it will be assumed that a longer time is needed for natural processes to work. No monitoring will be done after year ten and no mitigation maintenance will be attempted.

5) Native Plants for Marina Uplands - The riparian zone adjacent to the marina would be planted, by the Tribe, with native species found at that elevation in Neah Bay, such as dune grass. Dune grass, Elymus mollis, has been observed as the most common plant in the natural areas within the bay and plugs could be taken from the area and transplanted, and in time reseed themselves to create a dense stand. The plants would be monitored for several years by the Corps and at year five, the Corps and resource agencies would discuss results and determine if any further actions would be warranted.

6) Education Program - This program would be attended by key Tribal staff that will work for, or regulate, the marina and inform them of practices that must be maintained within the marina to lessen environmental impacts and comply with permit conditions.

7) Piling Options - The Makah Tribe is investigating the use of concrete, recycled plastic or reused creosoted pilings within the marina, but there are structural and design limitations that could limit them from use.

b. Crown Zellerbach Experimental Capping. The Crown Zellerbach site is at the north west end of Neah Bay and was used as a log rafting area from the early 1940's to 1981 and thus the sediments beneath this area are covered with wood debris. Several resource agencies have suggested remediation of the Crown Zellerbach site because of the perceived low dissolved oxygen (DO) in the western half of the bay. There is no known DO data for the bay, except for a couple of samples taken by the Tribe at the fish waste disposal area. These samples, which are outside of the Crown Zellerbach area, did show low DO (Dougherty, 1993). There is also limited data on sediment chemical contamination at the Crown Zellerbach site. In 1986, six sediment samples were taken at the Crown Zellerbach site to a depth of 10 cm. Zinc had the only PSDDA SL exceedance and it was only a minimal exceedance. In 1993, the Tribe took one sample at the Crown Zellerbach site to a depth of six feet. Mercury, chlorinated hydrocarbons, 1,2, 1,3 and 1,4-Dichlorobenzene and volatile organics were tested under PSDDA guidelines and all were found to be below the SL's.

There would be 30,000 cy of clean material available for use in a capping project. For a 3 foot cap, an area of 500 feet x 500 feet would be covered, which is approximately seven percent of the total Crown Zellerbach site. A pre and post monitoring study would be performed to determine if the substrate could support the capping material and to document the accuracy of the cap. This additional feature would increase costs considerably. If a total cap of the Crown Zellerbach site was desired, additional sediment would be needed. This material must be available at the time of project construction and consist of the correct consistency for a cap. The closest known federal project with a large quantity of clean material is Everett Harbor and the lower Duwamish River, which would have prohibitively high transportation costs.

The Corps does not support the Crown Zellerbach capping as a mitigation option for this project for several reasons. Most importantly, there is no data to prove of any dissolved oxygen (DO) or chemical contamination problem to warrant capping. Secondly, the 30,000 cy of available dredged material would only cap about seven percent, of the estimated 82 acres, of the Crown Zellerbach site. This is a small percent of the total site to provide any significant remediation. Also, Crown Zellerbach leased this property from the Washington Department of Natural Resources for use in their logging operations and the Tribe was not involved. Thus the Corps and the Tribe believe it is not the responsibility of the Tribe to remediate this site or to assume the liability associated with such a remediation. Lastly, capping projects involve intensive studies to determine the appropriate design, capping method and materials needed, and this would be time and cost prohibitive for this project.

8. Coordination. Telephone calls, meetings and correspondence with the following Federal and state environmental resource agencies and the local sponsors were undertaken to identify agency concerns and to receive planning input comments on project effects: U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and Washington Departments of Fisheries, Wildlife, and Ecology, as well as the local sponsors. The views of these agencies were given careful consideration in preparing this EA. In general, the resource agencies and local sponsor are supportive of the approved marina design and preferred mitigation plans. See Section 5, Coordination, of the main report for additional information.

9. Finding. Based on this Environmental Assessment and on coordination with local, state and Federal agencies, it is concluded that the proposed action will not be a major Federal action with major significant impacts on the human environment or affect the environmental integrity of Neah Bay.

References.

Anderson, Clifford M. 1985. Personal Communication, Kirkland, Washington.

Anderson, C.M. and P.M. DeBruyn. 1979. "Behavior and Ecology of Peregrine Falcons Wintering on the Skagit Flats, Washington. A Report on the 1979 Field Season." Washington State Department of Game Report.

Anderson, C.M., J.K. Fackler, D. Drummond, M. Finger, and A. Brewer. 1983. "The Spring Hawk Migration at Cape Flattery Peninsula, Clallam County, Washington." Unpublished Report.

Anderson, Clifford M., Randall K. Knapp, and James K. Fackler. 1984. "The Behavior and Ecology of Fall Peregrine Falcons at Lummi Bay and Vicinity, Whatcom County, Washington," under contract to Seattle District, U.S. Army Corps of Engineers.

Battelle, Marine Research Laboratory. 1984. "On the Characterization of Sediments from the Upper Duwamish River and from Neah and Clallam Bays," under contract to the Seattle District, Corps of Engineers, Seattle, Washington.

Beebe, F.L. 1960. "The Marine Peregrines of the Northwest Pacific Coast." Condor 62 (3):145-189.

Byrne, D., in Chapman, D. 1993. "Bird Census of Marina Project Site, 1992". January 21, 1993, Makah Tribal Council, Neah Bay, Washington.

Calambokidis, John, Gretchen H. Steiger, and James C. Cubbage. 1986. "Marine Mammals in the Southwestern Strait of Juan de Fuca: Natural History and Potential Impacts of Harbor Development in Neah Bay," under contract to the Seattle District, Corps of Engineers, Seattle, Washington.

Carter, H.R., Nov. 1984. "At-Sea Biology of the Marbled Murrelet (Brachyramphus marmoratus) in Barkley Sound, British Columbia", (M.T.) Dept. of Zoology, Univ. of Manitoba, Winnipeg, Manitoba (143 pp.).

Chapman, Donna. 1993a. "Bird Census of Marina Project Site, 1992", Makah Tribal Council, Neah Bay, Washington.

Chapman, Donna. 1993b. Personal Communication, Makah Tribal Biologist, Neah Bay, Washington.

Cox, Linda. 1992. "Intertidal Bivalve Study for the Proposed Commercial Boat Marina in Neah Bay, Washington, August 1992". U. S. Army Corps of Engineers, Seattle, Washington.

Crecelius, E., T. Fortman, S. Kiesser, C. Apts and O. Cotter. 1990. "Contaminant Loading to Puget Sound from Two Marinas". Battelle Marine Sciences Laboratory, Sequim, Washington.

Cummins, Eric. 1986. Personal Communication, Washington Department of Game, Aberdeen, Washington.

DiDomenico, Tom. 1984. Personal Communication, Makah Tribal Council, Neah Bay, Washington.

Dobler, Fred. 1986. Personal Communication, Washington Department of Game, Olympia, Washington.

Dougherty, Jim. 1993. Personal Communication, Makah Tribe Fisheries Biologist, Neah Bay, Washington.

Hayward, J.L., Jr., W.H. Gillett, C.J. Amlaner, Jr., and J.F. Stout. 1977. "Predation of Gulls by Bald Eagles in Washington," AUK, 94(2):375.

Klinger, D. 1991. "Fish and Wildlife Service Proposes Threatened Status for Marbled Murrelet", U.S. Fish and Wildlife Service, Region 1 News Release 91-04, Portland, Oregon.

Kuzis, Karen. 1986. Personal Communication, University of Washington, Seattle, Washington.

Leschner, Laura. 1984. Personal Communication, Washington Department of Game, Seattle, Washington.

Makah Indian Nation. 1977. "Master Plan and Feasibility Study, Marine and Heavy Equipment Repair Facility and Commercial Fishing Fleet Moorage," prepared by Reid, Middleton, and Associates, Inc., Edmonds, Washington.

Marshall, D.B. 1988. "Status of the Marbled Murrelet in North America: With Special Emphasis on Populations in California, Oregon, and Washington", U.S. Fish and Wildlife Service, Biological Report 88(30), Washington, D.C.

McAllister, Kelly. 1984. Personal Communication, Washington Natural Heritage Program and Department of Game - Nongame Program, Olympia, Washington.

Peaslee, Evelyn. 1986. Personal Communication, Seattle, Washington.

Richter, Joachim. 1984. Personal Communication, Mercer Island, Washington.

Shreffler, D. K. 1993a. Personal Communication, Sequim, Washington.

Shreffler, D. K. 1992. "Subtidal Scuba Surveys for the Proposed Commercial Boat Marina in Neah Bay, Washington, November 1992". Battelle/Marine Sciences Laboratory, Sequim, Washington.

Simenstad, Charles A., Bruce S. Miller, Carl F. Nyblade, Kathleen Thornburgh, and Lewis J. Bledsoe. 1979. "Food Web Relationships of Northern Puget Sound and the Strait of Juan de Fuca,"

Fisheries Research Institute, University of Washington, Seattle, Washington, under contract to Environmental Protection Agency, Washington, D.C.

Simenstad, C. A., R. M. Thom, K. A. Kuzis, J. R. Cordell, and D. K. Shreffler. 1988. "Nearshore Community Studies of Neah Bay, Washington". FRI-UW-8811, final contract report to the U. S. Army Corps of Engineers, Seattle District, prepared by the Wetland Ecosystem Team, Fisheries Research Institute, School of Fisheries, University of Washington, Seattle, Washington.

Simons, Bill. 1993. Personal communication, Makah Tribal Council, Neah Bay, Washington.

Speich, S.M., T.R. Wahl, and D.A. Manuwal, in press. "The Numbers of Marbled Murrelets in Washington Marine Waters", in Proceedings of the Symposium on Conservation of Alcids in the North Pacific, Pacific Seabird Group, sponsor. Published by Western Foundation of Vertebrate Zoology, Los Angeles, California.

U.S. Army Corps of Engineers, Seattle District. 1979. "The Northern Bald Eagle (Haliaeetus leucocephalus alascanus), A Literature Survey," Seattle, Washington.

U.S. Fish and Wildlife Service and Makah Tribe. 1985. "Distribution and Abundance of Juvenile Salmonids in Clallam Bay and Neah Bay, Washington". Unpublished report. 37 pp.

U.S. Fish and Wildlife Service. 1986. Continuing Planning Aid Letter for Neah Bay Navigation Improvements Project, Olympia, Washington.

Wahl, Terence R., Steven M. Speich, David A. Manuwal, Katherine V. Hirsch, and Christine Miller. 1980. "Marine Bird Populations of the Strait of Juan de Fuca, Strait of Georgia, and Adjacent Waters in 1978 and 1979," Wildlife Science Group, University of Washington, Seattle, Washington, under contract to Environmental Protection Agency, Washington, D.C.

CENPS-EN-PL-ER

MEMORANDUM FOR RECORD September 20, 1993

SUBJECT: DETERMINATION ON THE SUITABILITY OF DREDGED MATERIAL TESTED FROM THE PROPOSED NEAH BAY MARINA BOAT BASIN FOR DISPOSAL AT THE ADJACENT EAST BEACH FOR BEACH NOURISHMENT AND CORE MATERIAL WITHIN THE PONTOON (EAST BREAKWATER).

1. The following summary reflects the consensus determination of the following agencies (U.S. Army Corps of Engineers, Environmental Protection Agency, Washington State Departments of Ecology and Natural Resources) for the disposal of the estimated 50,000 cubic yards (cy) of material scheduled to be dredged from the boat basin of the proposed Neah Bay marina. These agencies were involved in the development of the sampling and anaylsis plan that outlines the chemical testing of the dredged material. Of this material, it is proposed that 14,000 cy be disposed in the interior of the pontoon for stabilization, 6,000 cy placed around the base of the pontoon for mitigation and 30,000 cy disposed on the adjacent east beach as beach nourishment for project mitigation. This project lies in both state and tribal waters (landward of -3.9 mean lower low water is designated tribal waters), with the majority of dredging in state waters. The determination of suitability is based on the acceptability of the sampling conducted on May 12-13, 1993, which characterized this material.

2. Sampling and testing followed the April 1993 Sampling and Analysis Plan for the proposed marina at Neah Bay. A total of six stations located at the proposed marina site were sampled. Four cores were collected from the boat basin and composited for one chemical analysis (C-1). Two additional cores were taken inshore of the dredging area, composited (C-2) and archived in the event that possible modifications to the marina design would require dredging of the boat basin closer to shore. The one composited analysis from the boat basin was analyzed for all PSDDA conventionals and chemicals of concern and the second composite from the inshore dredging area was analyzed for ammonia, total sulfides, PSDDA volatile organic compounds (VOCs) and mercury. These compounds were analyzed immediately to comply with their respective holding times. Sediments for all other PSDDA analyses for C-2 were archived in case the marina design is modified and these sediments need to be analyzed for the remaining PSDDA analyses.

3. Results showed all detected chemical levels were below PSDDA screening levels (SL's) and sediment quality standards (Chapter 173-204 WAC) for both samples. All organic compounds were undetected for C-1 except for four HPAHs: chrysene, fluoranthene, benzo(b)fluoranthene and pyrene. Concentrations for these organic compounds, however, were low and well below PSDDA SL's. For sample C-2, mercury was below the PSDDA SL and all PSDDA VOCs

were undetected. C-2 dichlorobenzenes were included in the VOC analysis in order to achieve detection limits that were below the PSDDA SLs. The dichlorobenzene compounds were undetected in the C-2 sample. Most PSDDA chemicals of concern were undetected in the sediments from the proposed dredging location. The few chemicals of concern detected were well below PSDDA screening levels. Based on these chemistry results, biological testing of the sediments was not deemed necessary.

4. This memorandum documents the suitability of proposed dredged sediments for disposal within and around the pontoon and on the adjacent beach for mitigation. It does not constitute final agency approval of the project. A project report and public notice will be released for public comment. During the public comment period, the resource agencies will provide input on the overall project. A final decision will be made after full consideration of tribal, public and agency input and after an alternatives analysis is done under Section 404 (b)(1) of the Clean Water Act.

Concur:

9/20/93
Date

Linda Cox
Seattle District Corps of Engineers

9/20/93
Date

David R. Kendall
Seattle District Corps of Engineers

9/30/93
Date

Justine Barton/John Malek
EPA Region X

9/28/93
Date

Sandra Manning
WA Dept. of Ecology

FINDING OF NO SIGNIFICANT IMPACT

CENPSEN-PL-ER August 25, 1993

DRAFT

FINDING OF NO SIGNIFICANT IMPACT
PROPOSED MARINA
NEAH BAY, WASHINGTON

The Makah Indian Tribe has requested that the Seattle District, U.S. Army Corps of Engineers, under Section 107 of the River and Harbor Act of 1960 (as amended), assist in constructing a small public boat basin at Neah Bay on the Makah Indian Reservation waterfront shoreline. The need for a protected marina at Neah Bay results from the changing scope of the commercial Indian and non-Indian fishery, from a one season, one species activity to a multi-species, year-round fishery. If winter wave protection at Neah Bay were available, both Tribal and non-Indian commercial fishermen would be able to avoid hours of travel time to fishing grounds from their existing safe moorage, e.g., Port Angeles and Port Townsend. In addition, a protected harbor would block wave action which was responsible for destroying or severely damaging 14 boats at Neah Bay in 1983, sinking 8 boats in 1988, two boats in 1989 and three in 1992. The proposed project features would also offer a safe harbor of refuge for vessels and increase employment opportunities in an economically depressed region.

An environmental assessment (EA) and Section 404 (b)(1) evaluation (appendix A) have been prepared. The proposed work consists of construction of a 200-boat marina. Approximately 50,000 cubic yards of sediment would be dredged to a depth of -15 feet, below mean lower low water (MLLW). The dredged material will be disposed of on an adjacent beach for mitigation and used within the breakwater construction. A 350-foot-long by 59-foot-wide concrete bridge pontoon (part of the former I-90 bridge across Lake Washington) would be grounded on the intertidal beach to protect the eastern side of the marina from the larger ocean waves. A 1,450-foot-long rock breakwater would protect the northern and part of the eastern side from ocean waves and waves generated within the bay. A 50-foot opening would remain between the north breakwater and the pontoon to allow for fish passage and increase flushing of the moorage basin. Mitigation consists of a marina design that has been modified to incorporate fisheries concerns, and the placement of 30,000 cubic yards of dredged material on the adjacent eroded beach for improved clam habitat. The work is scheduled from January 1, 1995 through March 15, 1996.

According to the EA and Section 404 (b) (1) evaluation, environmental impacts associated with the proposed dredging, disposal and placement of the north and east breakwater would include minor short-term impacts to water quality due to turbidity increases, minor short-term impacts to air quality and noise levels from operation of machinery, minor short-term stress

to aquatic organisms due to turbidity increases, removal of benthos from the boat basin and burial of benthic organisms at the disposal site and at the north breakwater and pontoon. There would be a temporary disturbance to waterfowl and shorebirds in the vicinity of the marina. The bald eagle, peregrine falcon, marbled murrelet and northern sea lion, threatened species in Washington, would not be affected by the proposed action.

Project sediments were chemically tested according to Puget Sound Dredged Disposal Analysis (PSSDA) guidelines to verify that there is no chemical contamination within the dredged material that could affect sediments at the disposal area. Results indicated that the dredged material is suitable for aquatic disposal.

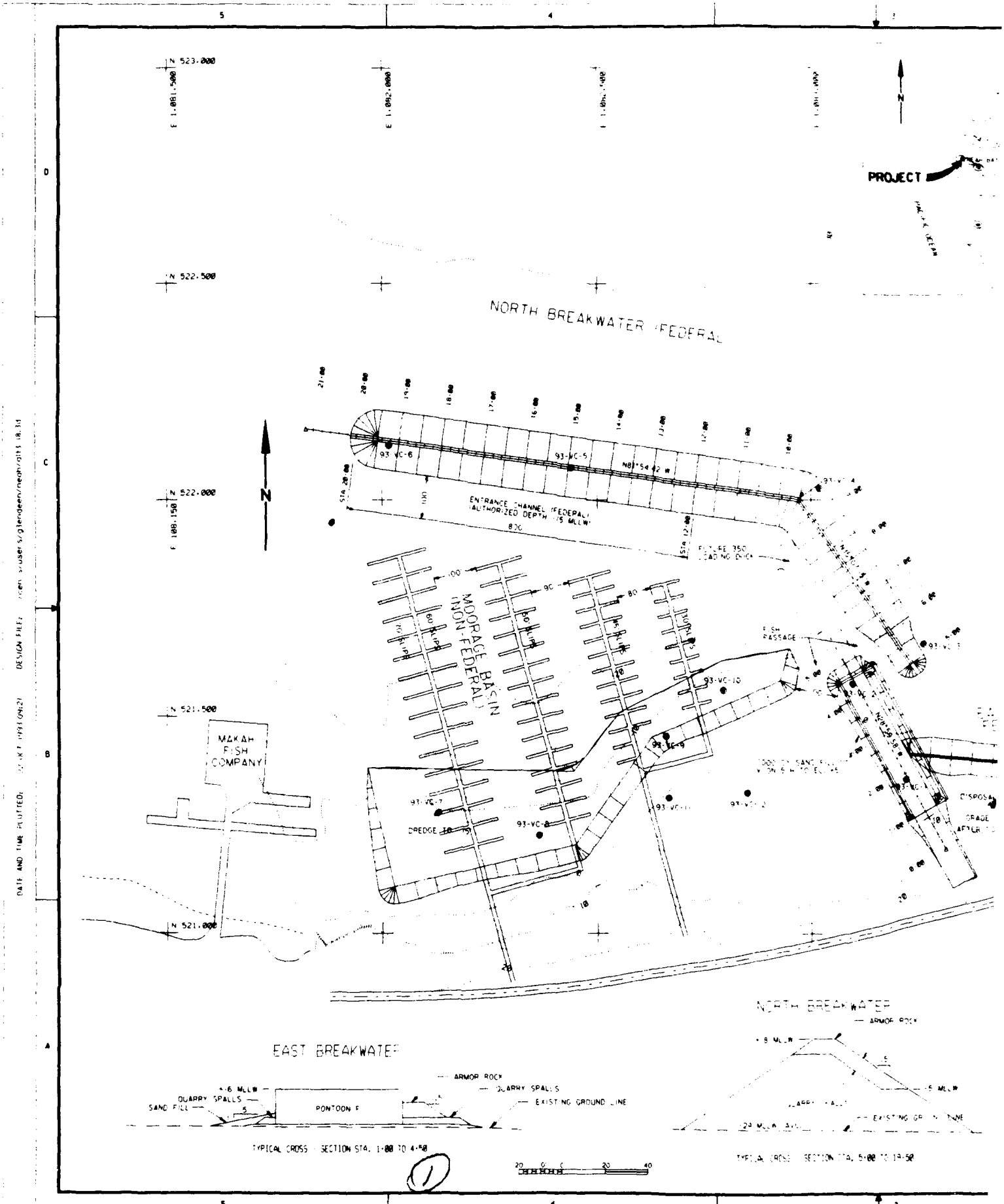
There are no known archaeological sites or Historic Places on the National Register within the project vicinity.

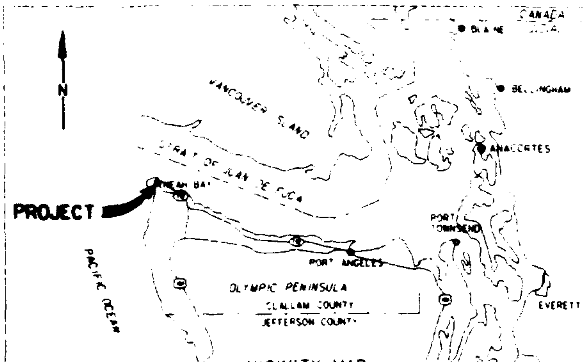
For the reasons described above, I have determined that dredging and disposal of materials from the Neah Bay boat basin and the placement of a rubble mound breakwater and pontoon will not result in significant impact on the human environment and therefore, does not require an environmental impact statement.

_____
Date

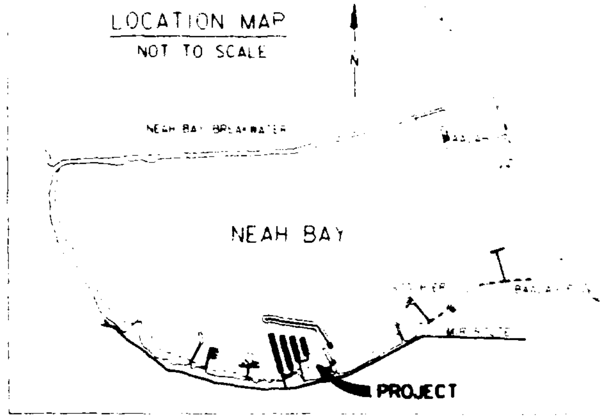
_____
Walter J. Cunningham
Colonel, Corps of Engineers
District Engineer

PLATES

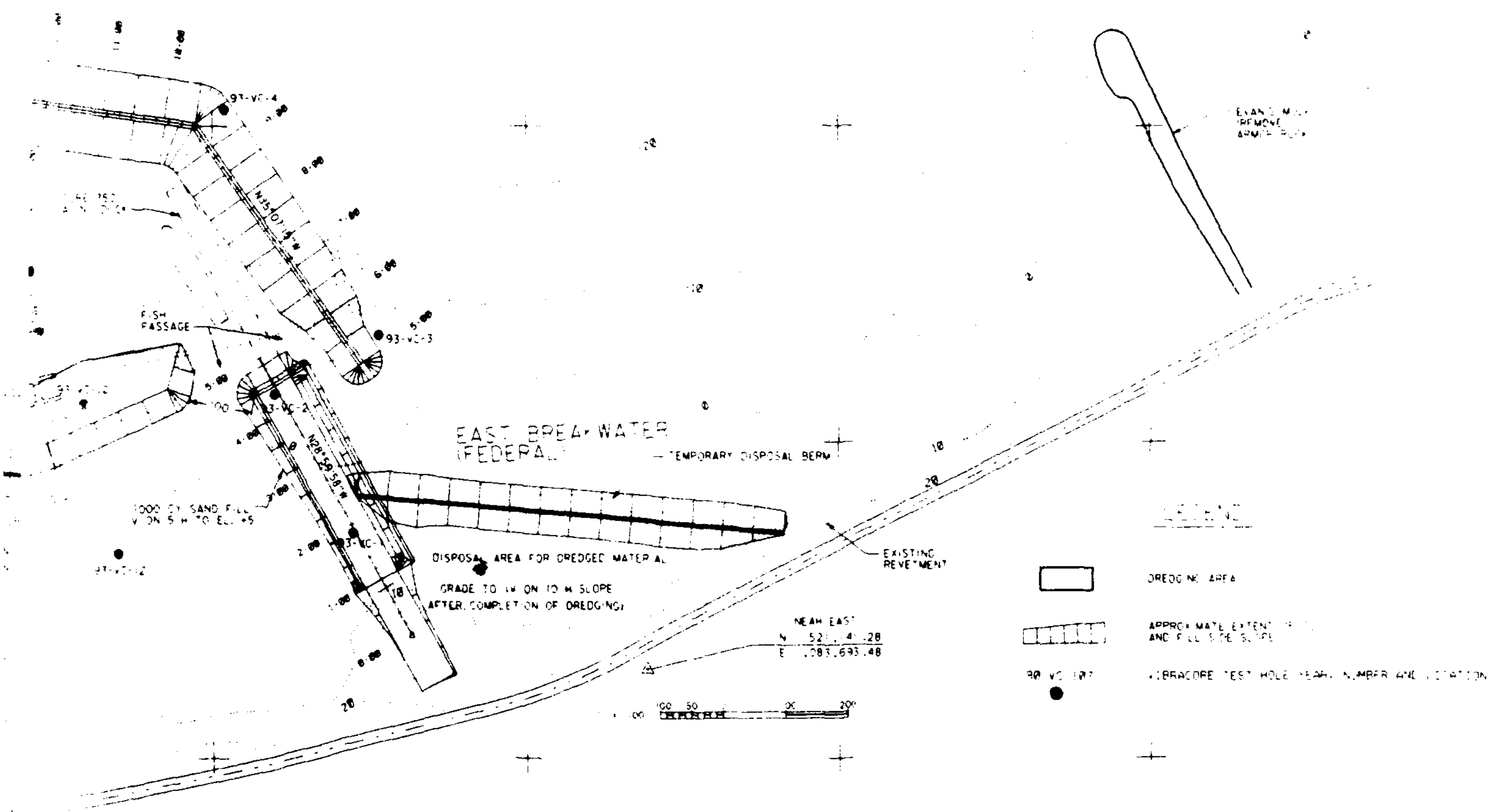

N 523.000
E 1,081,500
E 1,082,000
N 522.500
N 522.000
E 108,150
N 521.500
N 521.000
PROJECT
NORTH BREAKWATER (FEDERAL)
93-VC-6
93-VC-5
N81°54'42"W
ENTRANCE CHANNEL (FEDERAL)
AUTHORIZED DEPTH -45 MLLW
800
MOORAGE BASIN
(NON-FEDERAL)
MAKAH
FISH
COMPANY
93-VC-10
93-VC-9
93-VC-7
93-VC-8
DREDGE
FISH
PASSAGE
EAST BREAKWATER
ARMOR ROCK
QUARRY SPALLS
+6 MLLW
SAND FILL
PONTOON F
EXISTING GROUND LINE
TYPICAL CROSS SECTION STA. 1+00 TO 4+50
NORTH BREAKWATER
+8 MLLW
-45 MLLW
TYPICAL CROSS SECTION STA. 5+00 TO 19+50
20 0 5 20 40
DATE AND TIME PLOTTED:
DESIGN FILE:

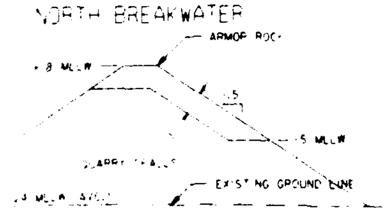


VICINITY MAP



LOCATION MAP
NOT TO SCALE





NORTH BREAKWATER

TYPICAL CROSS SECTION STA. 5+00 TO 19+50

NOTES:

1. SOUNDINGS AND ELEVATIONS ARE IN FEET AND REFER TO THE PLANE OF MEAN LOWER LOW WATER (MLLW). CONTOUR INTERVAL = 2 FEET.
2. THE CONDITION PRESENTED REPRESENTS THE RESULTS OF SURVEYS MADE ON THE DATES SHOWN, AND ONLY INDICATE THE CONDITION EXISTING AT THAT TIME.
3. AZIMUTH ON CENTERLINES OF THE BREAKWATERS ARE LAMBERT PROJECTION AND DIFFER FROM TRUE NORTH AZIMUTH BEARINGS.
4. HORIZONTAL CONTROL IS BASED ON LAMBERT GRID PROJECTION FOR WASHINGTON NORTH ZONE, NAD 27.
5. SEE SHEET 2 FOR BORE HOLE LOCATIONS, BORING LOGS, AND ADDITIONAL NOTES.

CONDITION: AUG 1992

REDUCED TO 38% OF FULL SIZE

U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

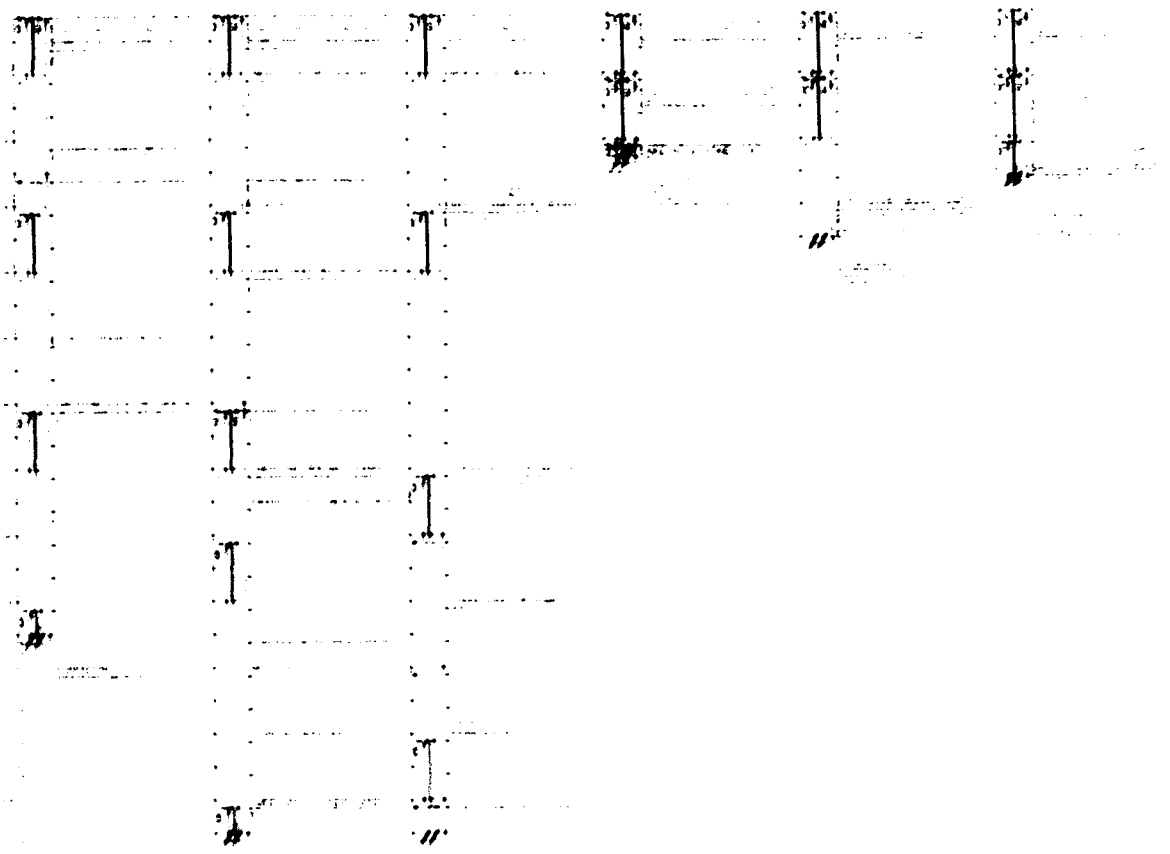
NEAH BAY NAVIGATION IMPROVEMENTS
PLAN & TYPICAL CROSS SECTIONS

NEAH BAY — WASHINGTON

DATE: 22 OCT 93 — 1
NELSON — 401

(2)

DATE AND TIME PLOTTED: 22-OCT-1993 09:2 DESIGN FILE: cenps users g3endeen neah dl13 8.3d



33-VC-06

EL +24.0

...E FINE ...E SHELLS.	SM	SILT WITH SAND (FINE) SEAMS, BLACK
...E, BLACK	SM	SILTY SAND (FINE) WITH LAYERS OF SILT AND SAND, BLACK
	GT	(APPROX 1/3 VOLUME SHELLS AND PEA GRAVEL LAYER AT 2.8')
...EL AND ...S DARK		VIBRACORE REFUSAL AT 2.8'

LEGEND

SP	POORLY GRADED SAND
SM	SILTY SAND
ML	NONPLASTIC SILTS OR LOW PLASTICITY
	REFUSAL BY EQUIPMENT USED
	LOCATION OF SAMPLE TAKEN FROM VIBRACORE TUBE FOR ELUTRIATE BRANCH (SEE NOTE 4)

NOTES:

1. SUBSURFACE EXPLORATION WAS ...SPECTED BY SEATTLE ... U.S. ARMY CORPS OF ENGINEERS ... MAY 1977 A 3 INCH DIAMETER PISTON VIBRACORE SAMPLER WAS ... BY SCIENCE APPLICATIONS INTERNATIONAL CORPORATION ... TWELVE TEST HOLES 33-VC-01 ... VIBRACORE WERE ... TO 2.8 FEET IN DEPTH.
2. TEST HOLE LOGS ARE ENTIRELY ATTEMPTED ... IN THE VIBRACORE SAMPLER ... PENETRATED. ACTUAL SAMPLE RECOVERIES ... SAMPLER PENETRATION TABLE.
3. ELEVATIONS REFER TO MEAN LOWER WATER.
4. SOIL RECOVERED BY THE VIBRACORE WAS ... ACCORDING TO THE UNIFIED SOIL CLASSIFICATION SYSTEM.
5. BIOLOGICAL, CHEMICAL AND PHYSICAL ANALYSES WERE PERFORMED ON TEST HOLES 33-VC-... THE STATISTICAL RESULTS OF THESE CORE SPECIMENS TAKEN FROM VIBRACORE TUBE FOR BIOLOGICAL, CHEMICAL AND PHYSICAL ANALYSES ... SOUND DREDGED MATERIAL ANALYSIS PROGRAM. DELINEATION PERFORMED ON TEST HOLES 33-VC-... ARE NOT SHOWN ON TEST HOLE LOGS.

VIBRACORE PENETRATION AREA

TEST HOLE NUMBER	SAMPLER PENETRATION: NUMBER OF BLOWS	...	PENETRATION TIME	SAMPLE RECOVERED
33-VC-	**	**	**	**
1	-	0.8	2	1
2	-	1.8	7.5	1.8
3	-	1.8	7	1.8
24	-	2.8	7	2
25	-	2.8	6	-
26	-	2.8	6	2

** DO NOT RECORD

(2)

REDUCED TO 1/2 FULL SIZE

U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

NEAH BAY, WASH.

FOUNDATION EXPLORATION
TEST HOLE LOGS

NEAH BAY

DATE AND TIME PLOTTED: 28-JUN-1977 ...

DESIGN FILE: ...

2

7.85 ACS. FOR PROJECT WITHIN NAVIGATIONAL SERVITUDE AREA.

0.14 ACS. FEE MITIGATION AREA

1.40 ACS. FOR PERMANENT ACCESS ROAD EASEMENTS AND PERMANENT BORROW AREA EASEMENT.

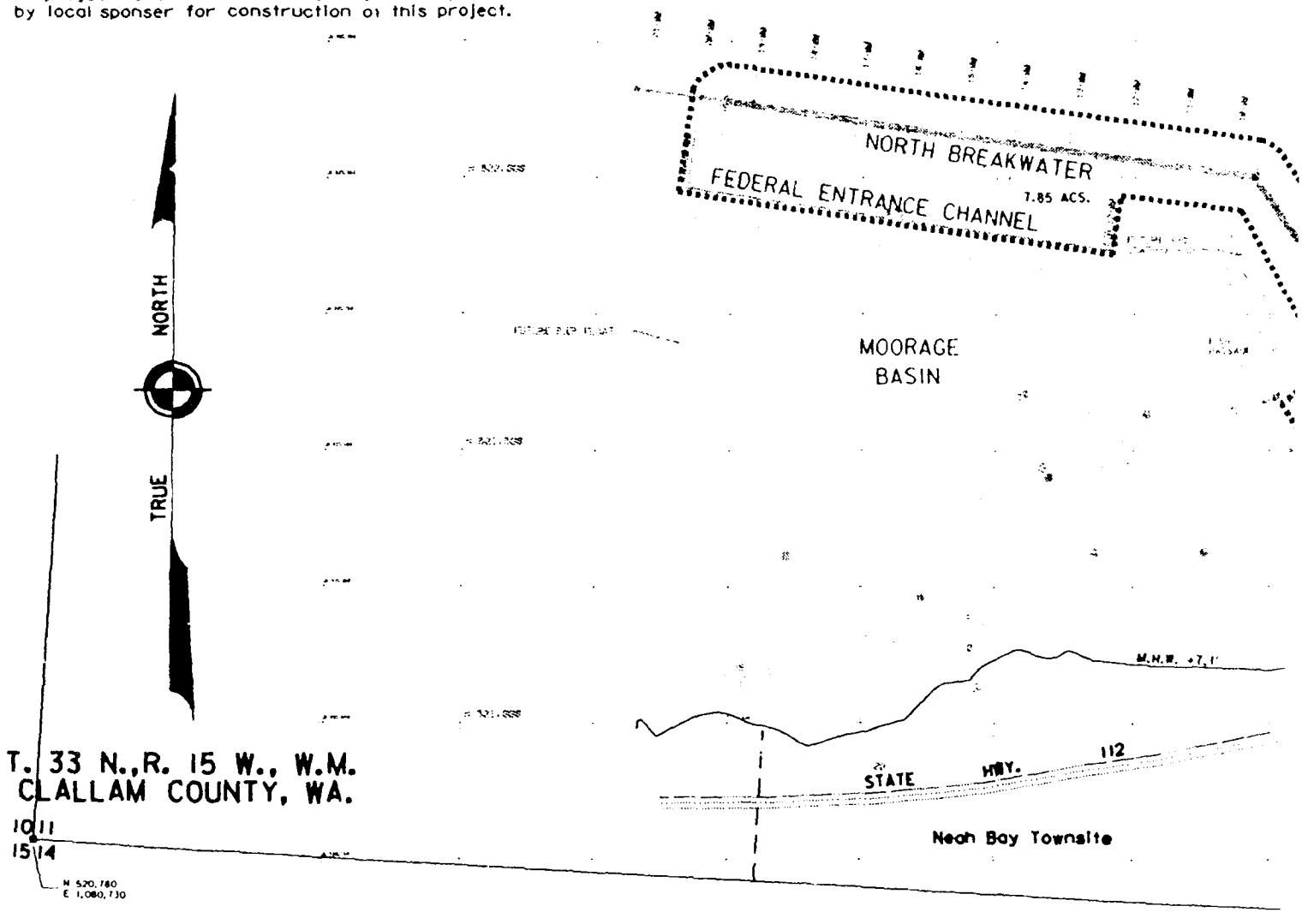
2.11 ACS. TEMPORARY EASEMENT-WORK AREA, UPLAND DISPOSAL AREA .

11.50 ACS. TOTAL PROJECT AREA.

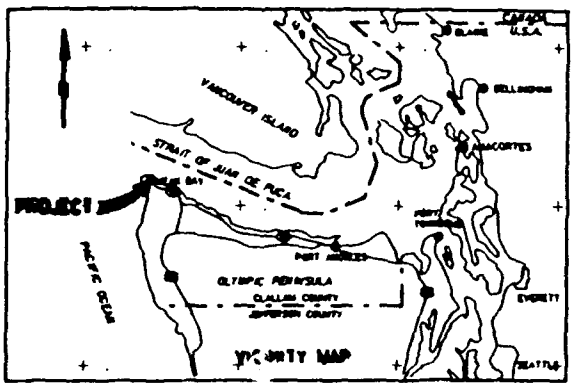
NOTES:

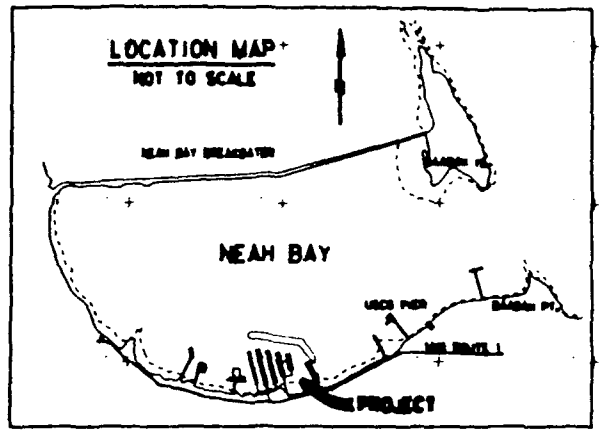
All project land below M.H.W. [+7.1'] is subject to navigational servitude.

All project land above M.H.W. [+7.1'] will be provided by local sponser for construction of this project.

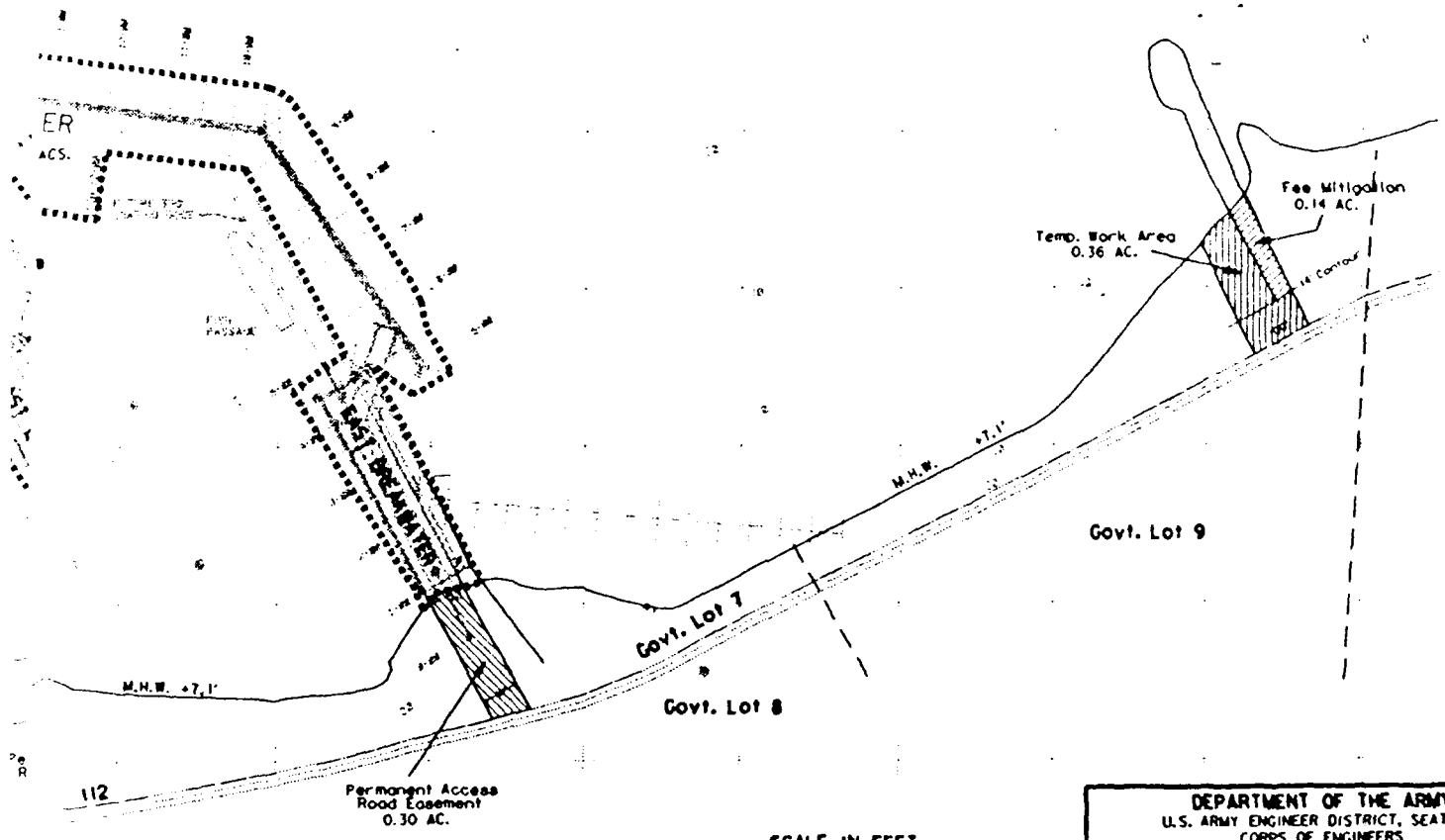


Horizontal control based on Coordinate System, North





NEAH BAY



SCALE IN FEET
200 100 0 200 400

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
NORTH PACIFIC DIVISION

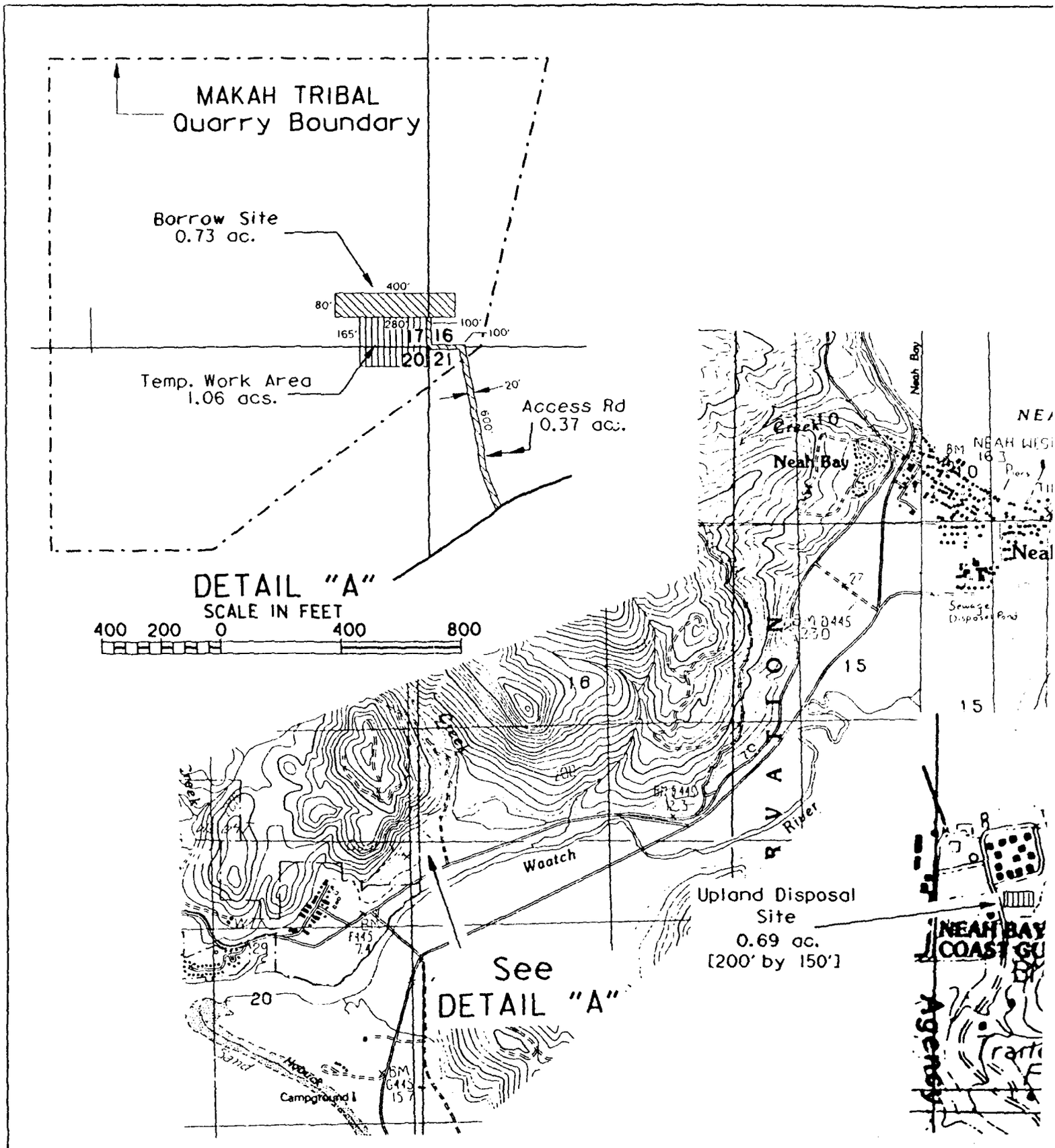
REAL ESTATE

NEAH BAY/SEC. 107
Small Navigation Improvement
Project

BY: E.M.L. PLATE NO. 3 FILE NO. NEAHRE 9 AUG 93

onsite

izontal control based on Washington State Plane
rdinate System, North Zone

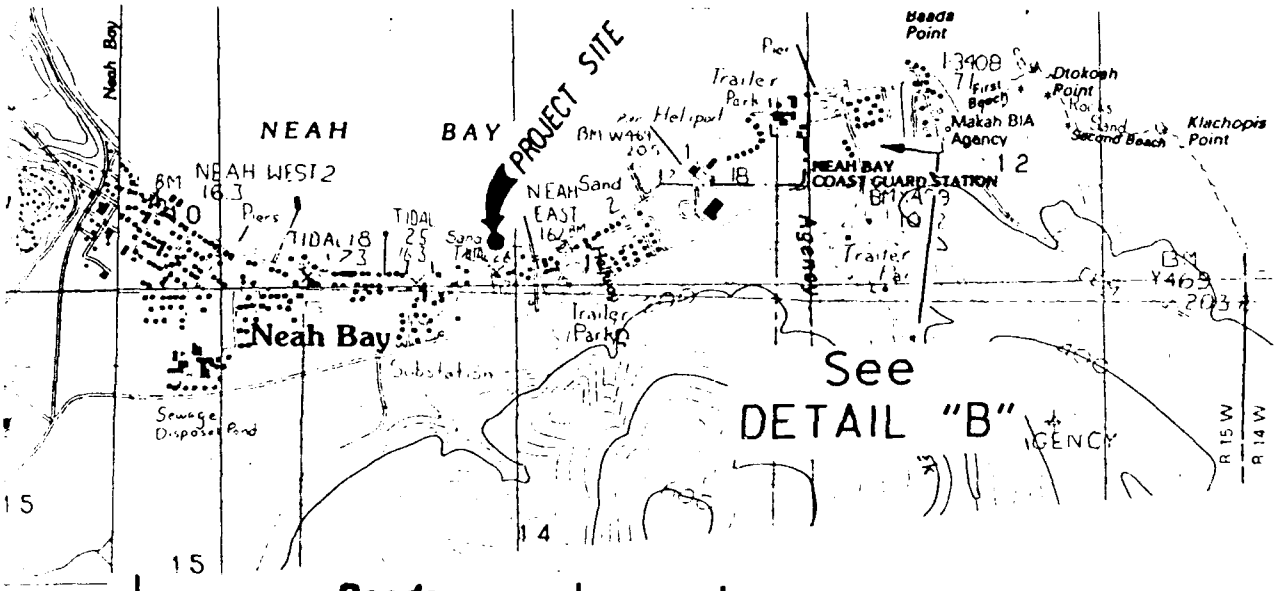

MAKAH TRIBAL
Quarry Boundary
Borrow Site
0.73 ac.
Temp. Work Area
1.06 acs.
Access Rd
0.37 ac.
400'
80'
280'
100'
165'
100'
20'
600'
17
16
20
21
DETAIL "A"
SCALE IN FEET
400 200 0 400 800
See
DETAIL "A"
Upland Disposal
Site
0.69 ac.
[200' by 150']
Neah Bay
Creek
Waatch
River
Campground
Sewage
Disposal Pond
NEAH BAY
COAST GU
15
16
20
27
29

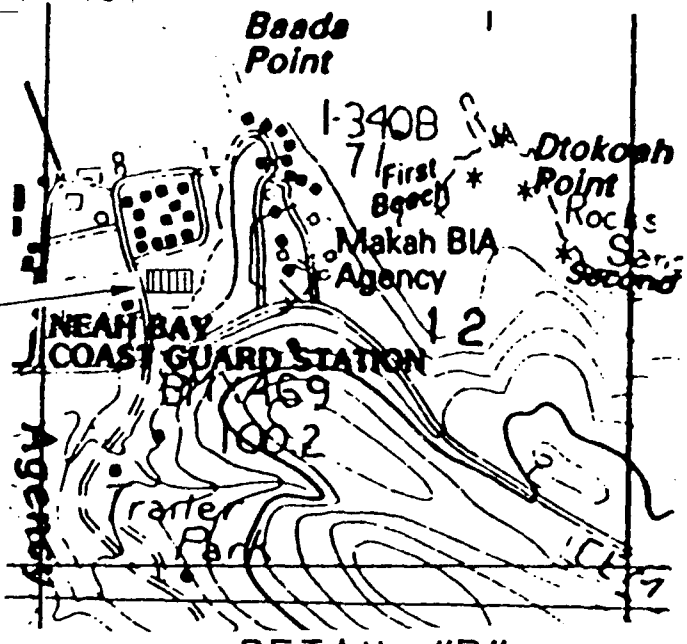
SCALE IN FEET

2000 1000 0 2000 4000

NORTH

TRUE





DETAIL "B"

NO SCALE

T. 33 N., R. 15 W., W.M.
Clallam County, Wa.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
NORTH PACIFIC DIVISION

REAL ESTATE

NEAH BAY SEC. 107
Small Navigation Improvement

UPLAND BORROW, WORK AREA & DISPOSAL SITE

BY: E.H.L.

PLATE NO. 4

FILE NO. NEAHRE

9 AUG 93

(2)

PLATE 5 - DESIGN AND CONSTRUCTION SCHEDULE

Plate 5 will be included in the final report. See pp. 33 and 34 of the main report and p. D-19 for the schedule summary.

APPENDICES

APPENDIX A

Part 1 - Section 404(b)(1) Evaluation

Part 2 - Public Notice

Part 3 - Public and Agency Comments on Public Notice and Corps of Engineers Responses

APPENDIX A - PART 1

SECTION 404(b)(1) EVALUATION

CENPS-EN-PL-ER August 25, 1993

DRAFT
SECTION 404(b)(1) EVALUATION
PROPOSED MARINA
NEAH BAY, WASHINGTON

1. Introduction. This evaluation has been prepared pursuant to the proposal by the Makah Indian Tribe to construct a commercial fishing boat marina in Neah Bay, Washington. The following evaluation was prepared according to Section 404(b)(1) of the Clean Water Act in accordance with guidelines promulgated by the Environmental Protection Agency (EPA) (40 CFR 230) for evaluation of the discharge of dredged and fill material into waters of the United States. References to the environmental assessment (EA) for this action will be made throughout this 404 evaluation.

2. Project Description and Background. The proposed project plan is to develop a commercial marina along the central portion of the south shore of Neah Bay. The marina could accommodate an estimated 200 boats and would be dredged to a depth of 15 feet below mean lower low water (MLLW). A 350-foot-long by 59-foot-wide pontoon (part of old damaged I-90 bridge across Lake Washington) would protect the eastern side of the marina from the larger ocean waves, and a 1,450-foot-long rock breakwater would protect the northern and part of the eastern side from waves generated within the bay. A 50-foot opening would remain between the north breakwater and the pontoon to allow for fish passage and increase flushing of the marina basin. Approximately 50,000 cubic yards (cy) of sand would be dredged for the boat basin of which about 14,000 cy would be used as core material in placing the pontoon and 6,000 cy placed around the pontoon. Alternatives for disposal of the remaining 30,000 cy of dredged material include use of the material in filling the adjacent east beach for improved clam habitat for mitigation or placing it at an upland site.

3. Need for Fill. See section 3 of the EA.

3.1 Location. The proposed marina is located in the center of the south shoreline of the Neah Bay coastline. Refer to the accompanying Draft Detailed Project Report, figure 1-1.

3.2 Description of Fill Site.

a. North breakwater. The depth of this site ranges from -2 to -23 feet MLLW and the substrate is sand. The area that will be covered by the breakwater is 4.4 acres. Refer to Section 4 of the EA for biological productivity for this section.

b. East breakwater (pontoon). The depth of this site ranges from +8 to -2 feet MLLW and the substrate is sand. The area that will be covered by the pontoon is 0.5 acres.

c. Dredged disposal site/Temporary disposal dike. Approximately 30,000 cy of the dredged material will be placed on the beach, adjacent to the pontoon. This placement is part of the mitigation plan and will cover 8 acres of sandy substrate at an elevation range of -4 to +8 feet MLLW. The dike will cover an area of 0.5 acres at an elevation range of 0 to +4 feet MLLW.

3.3 Method of discharge.

a. North breakwater. A road will be created by offloading rock by truck for the construction of the north breakwater. When complete the rock will be removed between the pontoon and the north breakwater to create a 50 foot opening for shallow water fish passage.

b. Pontoon. Refer to Section 2.03.f of appendix D for the pontoon placement description.

c. Dredged disposal site/temporary disposal dike. The dredged material will be placed by pipeline dredge.

3.4 Disposal Schedule. Disposal will be performed between January 1, 1995 and March 15, 1996 and will avoid peak periods of juvenile salmonid migration. Dredging and disposal will require approximately three weeks. No work will be conducted for the period beginning March 15 through June 15.

3.5 General Characteristics of Material.

a. North breakwater. Clean rock from a quarry.

b. Pontoon. Concrete structure.

c. Dredged material/temporary disposal dike. Dredged material from the boat basin will be used for construction of the temporary disposal dike. This material consists of fine sand.

3.6 Quantity of Material.

a. North breakwater. 161,000 cy of quarry spalls and 20,000 cy of armor rock.

b. Pontoon. One 350-foot-long by 59-foot wide by 16-foot-high concrete structure.

c. Dredged disposal site/temporary disposal dike. Approximately 30,000 cy of material would be discharged to construct the disposal dike and the mitigation beach feed.

3.7 Source of Material.

a. North breakwater. There are nine quarries within a 35 mile radius of Neah Bay that may be able to supply the required rock.

b. Pontoon. Salvaged portion of I-90 Lake Washington floating bridge.

c. Dredged disposal site/temporary disposal dike. The dredged material will be from the boat basin.

4. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem.

4.1 Substrate.

a. North breakwater. Breakwater placement will affect the substrate of the placement area by permanenty covering it.

b. Pontoon. Same as 4.1.a.

c. Dredged disposal site/temporary disposal dike. Same as 4.1.a.

4.2 Water Quality. Only temporary reductions in water quality at and around the fill sites are expected during construction and disposal operations. These include minor depression of dissolved oxygen, short-term increases in turbidity, and insignificant release of organic matter and sediment-associated chemicals of concern. These effects will be primarily associated with the dredged material disposal. These adverse effects to water quality will be minor and temporary. Significant or unacceptable effects are not anticipated. The quality of sediments at the disposal site will not be significantly affected by disposal of project sediments. The dredged material was tested under Puget Sound Dredged Disposal Analysis (PSDDA) guidelines and had no chemical exceedances, thus the material is suitable for open-water disposal. In summary, adverse effects on water quality and biota from dredged material chemicals, quarry rock for the breakwater and pontoon placement are not expected to be significant. Refer to section 7.g of the EA.

4.3 Current Patterns and Water Circulation. Current patterns in Neah Bay will not be altered by the proposed discharges. Refer to Section 2.05, Appendix D, of the main report.

4.4 Normal Water Fluctuations. No adverse effects are anticipated to daily, seasonal, or annual tidal and flood fluctuations.

4.5 Salinity Gradients. The proposed project will have no impact on salinity gradients.

5. Potential Impacts on Biological Characteristics of the Aquatic Ecosystem.

5.1 Threatened and Endangered Species. No threatened or endangered species are expected to be significantly impacted by the project disposal or fill activities. Refer to Section 7.f of the EA.

5.2 Aquatic Food Web. The fill and disposal sites will be physically impacted by the discharging of dredged material and the placement of fill material. During the placement of the north breakwater and pontoon, plankton will be displaced or buried by the fill. The area covered by the breakwater and pontoon will be permanently removed from benthic production. These losses should not be significant, as the sites where the breakwater and pontoon are located are not very biologically productive. A productive biological community will result in the long term as many species will colonize the new breakwater and pontoon habitat. The disposal area will have a temporary dike constructed to dewater the sediment before it is used within the mitigation area. This dewatering will minimize turbidity affects within the water column. The area covered by the dike and the disposal material will be temporarily removed from benthic production, but in time clams and other infaunal organisms will recolonize the dredged material that has been spread over the beach as mitigation. There should be an net increase in biological productivity within ten years. Refer to Section 7 of the EA.

5.3 Wildlife. Construction and placement of the breakwater and pontoon and disposal activities will temporarily displace birds and mammals found at the fill sites during the time of placement and disposal operations, but this temporary displacement is not expected to result in significant effects to these species. Refer to Section 7 of the EA.

6. Potential Impacts on Special Aquatic Sites.

6.1 Mudflats. The proposed project will alter the mudflat community within the boat basin and the mitigation site adjacent to the pontoon. The mudflats within the boat basin from -2 to -15 feet MLLW will be dredged and the mudflats above this elevation will remain. A portion of the mudflats at the adjacent beach, the mitigation site, will be covered by 30,000 cy of dredged material that will be placed at the western end of the beach to create better quality clam habitat.

7. Potential Effects on Human Use Characteristics.

7.1 Recreational and Commercial Fisheries. Potential dredged material discharge and fill effects on recreational and commercial fisheries are expected to be minimal. Refer to Section 7.c of the EA.

7.2 Water Related Recreation. There will be a beneficial impact to recreational boating by providing a year-round protected harbor with updated facilities.

7.3 Esthetics. The disposal activity is not expected to significantly affect area esthetic values.

7.4 Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves. No impacts are expected.

8. Evaluation and Testing of Discharge Material.

8.1 General Evaluation of Dredged or Fill Material. Dredged material is considered suitable for aquatic disposal. Refer to section 4.h of the EA and 4.2 of this evaluation. The rock for breakwater construction will be from the Tribal quarry, considered a clean source. Testing of pontoon concrete was determined unnecessary.

8.2 Evaluation of Chemical-Biological Interactive Effects.

8.2.1 Exclusion of Material from Testing. Sediments were not excluded but were chemically tested according to PSDDA evaluation procedures. The results indicate that all chemicals of concern were below screening levels, which means that the sediments are suitable for open-water disposal. Rock and quarry spalls were excluded by their large size and clean upland source.

8.2.2 Water Column Effects. Rapid settling of discharged material is expected, resulting in no significant water column effects.

8.2.3 Effects on Benthos. Refer to Section 5.2 above and Section 7.b. of the EA. No significant impacts on benthos is anticipated.

8.3 Comparison of Excavation and Discharge Sites.

8.3.1 Total Sediment Chemical Analysis. Refer to Section 4.h. of the EA.

a. Material to be dredged was analyzed and is clean. This material will be placed on intertidal beach sand, also considered clean.

b. The quarry rocks and spalls are from a source considered clean and are being placed on a subtidal, sandy substrate also considered clean.

8.4 Physical Tests and Evaluations.

a. Material to be dredged is coarse sand and the disposal site is also coarse sand.

b. The quarry rock for the north breakwater is dissimilar to the subtidal sandy substrate.

9. Factual Determinations.

9.1 Physical Substrate Determinations. The dredged material has approximately the same grain size as the disposal area and will have minimal impact on disposal area substrate. The pontoon is a large, concrete structure. The quarry rock/spalls is standard size for quarry material.

9.2 Water Circulation, Fluctuation, and Salinity Determinations. Fill placement and disposal is not expected to significantly impact these parameters.

9.3 Suspended Particulate/Turbidity Determinations. Turbidity increases due to the proposed discharges will be minimal and short lived.

9.4 Contaminants Determinations. The dredged material is acceptable for aquatic disposal as it contains no chemicals of concern that are above PSDDA screening levels. Refer to Section 8.1 of this evaluation. The concrete in the pontoon and the quarry rocks have no known contaminants of concern.

9.5 Aquatic Ecosystem and Organism Determinations. Refer to Section 5.2 of this evaluation. Placement of dredged and fill material should not significantly affect the Neah Bay aquatic ecosystem.

9.6 Determination of Cumulative Effects on the Aquatic Ecosystem. Based on the information in the EA for this project, it is expected that the proposed discharge will not contribute significantly to cumulative impacts on the Neah Bay aquatic ecosystem .

9.7 Determination of Secondary Effects on the Aquatic Ecosystem. No significant secondary effects on the project vicinity aquatic ecosystem are anticipated from the proposed disposal.

10. Proposed and Alternative Actions to Minimize Adverse Effects. Disposal will not occur during 15 March through 15 June to avoid fisheries impacts. Material will be placed behind a temporary disposal dike to dewater and to minimize turbidity impacts in the bay. Dredged material has been tested under PSSDA sediment guidelines and is suitable for aquatic disposal.

11. Analysis of Practicable Alternatives.

11.1 Identification and Evaluation of Practicable Alternatives. Three design alternatives were evaluated. Variation 2 consists of a concrete pontoon for the east breakwater with a rubble mound structure, steel pilings and concrete panels for the north breakwater. Variation 3 also uses a concrete pontoon, but the

north breakwater consists of only a rubble mound structure. Lastly, variation 4 is made entirely of a rubble mound structure with no pontoon. These alternatives are discussed in Sections 5, 6 and 8 of the EA.

11.2 Evaluation of Alternatives to Discharge in Special Aquatic Sites. Refer to Sections 5, 6 and 8 of the EA. After the alternatives evaluation in the EA, it is concluded that there are no practicable alternatives to the proposed project.

12. Review of Conditions for Compliance.

12.1 Availability of Practicable Alternatives. See sections 5, 6 and 8 of the EA. In terms of cost, logistics and technology, there is no practicable alternative that would fulfill project objectives and have less adverse impact on the Neah Bay aquatic ecosystem.

12.2 Compliance with Pertinent Legislation.

12.2.1 Threatened and Endangered Species (Endangered Species Act of 1973). No threatened or endangered species will be adversely affected by the proposed action (See section 7.f of the EA).

12.2.2 Marine Sanctuaries (Marine Protection, Research, and Sanctuaries Act of 1977). No marine sanctuaries are located in the vicinity of the proposed action.

12.3 Potential for Significant Degradation of Water as a Result of the Discharge of Polluted Material. Water quality will not be significantly degraded by disposal of project area sediments.

12.4 Steps to Minimize Potential Adverse Impacts on the Aquatic Ecosystem. Disposal will not occur during 15 March through 15 June to minimize juvenile salmon impacts. Dredged material was tested under PSDDA guidelines to verify that there is no chemical contamination. To decrease turbidity within the water near the disposal area, a temporary dike will be constructed to allow dredged material to first dewater before it enters the bay.

13. Findings. The discharge of dredged material and the placement of quarry spalls and the pontoon breakwater for the construction of the Neah Bay boat basin complies with the Section 404(b)(1) guidelines.

APPENDIX A - PART 2

PUBLIC NOTICE

DELAY OF PUBLIC NOTICE

Water quality certification for the proposed breakwater and dredging project at Neah Bay will be pursued following Public and Agency Review of the draft Detailed Project/Environmental Assessment. A Section 10/Section 404 Public Notice soliciting comment on the project will be distributed at that time.

APPENDIX A - PART 3

PUBLIC AND AGENCY COMMENTS ON PUBLIC NOTICE AND CORPS OF ENGINEERS RESPONSES

APPENDIX B

STUDY COORDINATION AND PUBLIC INVOLVEMENT

Part 1 - Coordination and Public Involvement

Part 2 - Coordination Letters

Part 3 - Fish and Wildlife Coordination Act Report and Corps of Engineers Responses

Part 4 - Comments and Responses

APPENDIX B - PART 1

COORDINATION AND PUBLIC INVOLVEMENT

APPENDIX B - PART 1

COORDINATION AND PUBLIC INVOLVEMENT

1.01 Coordination and Public Involvement Framework. Coordination has been accomplished during the study through meetings, telephone calls, an agency site visit, and correspondence with Federal, state, and local agencies. Close coordination was maintained with the Makah Indian Tribe, local sponsor, throughout plan formulation. The draft detailed project report and environmental assessment (DPR/EA) was distributed in November 1993 for a 30-day public and agency review. In conjunction with the public review, a public information meeting was announced and held on , 1993, at Neah Bay. The recommended plan was presented for discussion and comment. Section 5.01 of the main report gives a summary of the public meeting proceedings.

1.02 Study Participants. The mailing list for review of the draft DPR/EA included the following agencies and groups as well as the local media.

a. Federal Agencies.

Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Department of Health and Human Services
Department of the Interior
Fish and Wildlife Service
National Park Service, Interagency Archaeological Services
Department of Transportation, 13th District Coast Guard
Environmental Protection Agency, Region 10

b. Washington State Agencies.

Department of Commerce and Economic Development
Department of Ecology
Department of Fisheries
Department of Natural Resources
Department of Transportation
Department of Wildlife
Office of Archaeology and Historic Preservation

c. Local Government.

Clallam County Planning Department
City of Sequim
City of Forks
Port of Port Angeles
City of Port Angeles
Port of Port Townsend
City of Port Townsend

d. Other.

Makah Tribal Council
Quileute Tribal Council
Point No Point Treaty Council
Lummi Indian Business Council
Evergreen Legal Services
Federation of Western Outdoor Clubs
Friends of the Earth
Northwest Salmon and Steelhead Council
Seattle Audubon Society
Seattle Chapter Isaac Walton League
Sierra Club
Washington Environmental Council
Washington Public Ports Association
Local libraries

1.03 Study Coordination. Coordination of the draft DPR/EA is discussed in section 5.03 of the main report. Public and agency review comment letters received during the 30-day draft DPR/EA review period are contained, along with responses to these comments, in appendix B, part 4.

APPENDIX B - PART 2

COORDINATION LETTERS

APPENDIX B, PART 2

COORDINATION LETTERS

TABLE OF CONTENTS

MAKAH TRIBAL COUNCIL
P.O. BOX 115 · NEAH BAY, WA. 98357 · 206-645-2205

January 8, 1990

Colonel Milton Hunter
District Engineer
U.S. Army Engineer District, Seattle
P.O. Box C-3755
Seattle, WA 98124-2255

Dear Colonel Hunter:

This letter is to seek assistance of the U.S. Army Corps of Engineers under section 107 of the 1960 River and Harbor Act as amended in constructing navigation and harbor improvements at Neah Bay, Clallam, Washington.

The Corps of Engineers has previously studied feasibility study of improvements at Neah Bay. Mr. William Simons our Economic Development Director has been in contact with Mr. Steve Babcock of your Planning Branch staff regarding the previous studies that were conducted. After reviewing these studies it would appear that there are significant economic factors which now exist that would favor construction of a safe harbor at Neah Bay. These involve a substantial expansion of fishing during the winter months that can only be conducted different stages that the harbor exists at Neah Bay. Also the Tribe is considering several potential uses for forest products related industries. There would also appear to be expanded potential for year round charter boat operations out of Neah Bay similar to those run on Vancouver Island.

The Makah Tribal Council is going to dedicate funds and make a commitment to share the cost of this project including the feasibility phase study, and has identified a source of funds for that purpose. We understand the reconnaissance phase study would be funded 100% Federal. The Tribal Council has also identified the harbor development as one of the top priorities for the Tribe and the community has indicated a strong interest in harbor development.

In 1988, Neah Bay suffered a winter storm which sank five boats in our fleet. A similar storm occurred in 1983 and storms with less severity have occurred in past years. The Makah Tribe has sought and has been successful in obtaining rights to harbor

certain ground fish species which require larger boats and harbor which they can be moored in during bad weather. Additionally, the fleet of local fishing boats has grown dramatically in the past few years there are currently 90 boats in the fleet and estimated 30 additional boats that use the harbor on a regular basis to deliver fish to the two fish processors in the bay.

On behalf of the Tribal Council I would request that a meeting be arranged preferable on February 1 or 2, between the Corp of Engineers, Mr. Donald Johnson a member of the Makah Tribal Council, Mr. William Simons our Economic Development Director and other interested parties.

Your consideration is appreciated.

Sincerely,

MAKAH TRIBAL COUNCIL

Vivian C. Lawrence

Vivian C. Lawrence
Vice Chairman

VCL:mk
colhunte

MAKAH TRIBAL COUNCIL

P.O. BOX 115 • NEAH BAY, WA 98357 • 206-645-2201

December 21, 1992

U.S. Corps of Engineers
Planning Branch
P.O. Box C3755
Seattle, WA 98124-2255

ATTN: Ms. Joanne Green

RE: Selection of Design Approach for Neah Bay Breakwater

Dear Joanne:

Based on the Johnson Coastline design and cost data as revised and influenced by U.S. Corps of Engineer's design and and cost data dated December 8, 1992, the Makah Tribal Council has approved the breakwater configuration using the one pontoon (Designated F) design approach.

Insofar as the Makah Tribe is concerned the breakwater/marina project should proceed with final design studies based on this approach.

Please refer any questions to the undersigned.

Sincerely,

George O. Hottowe
Marina Project Director

CENPS-EN-PL-PF 4 Feb 1993

MEMORANDUM FOR: George Hottowe, Project Manager, Makah Tribe

SUBJECT: Changes to Proposed Marina Layout as a Result of Agency Concerns

1. Enclosed for you review and comment are two marina layouts. Alternative 1 is the layout that was prepared for agency consideration on the 20-22 January 1993 mitigation planning field trip to Neah Bay. This was previously coordinated with you. The main concern of the agencies was to reduce impacts by marina design. They hoped we would be able to reduce dredging, especially in the band of +2 ft to -2 ft Mean Lower Low Water (MLLW). Alternative 2, a revised layout, has been prepared by Eric Nelson. We believe this layout answers most of their concerns.

2. Please review this new layout and give us your comments by 8 Feb 1993, if possible. If you approve of this revision, we will send it to the agency staff that participated in the field trip for their comment. We will then produce a memo of the mitigation planning status and send it to all participants. We hope then to complete the mitigation planning and scope sampling for environmental sediment testing.

Joanne Green
Study Manager, Phone (206) 764-3706

Comparison of Features of Alternatives 1 and 2

1. Dredging.
   Alt 1 151,000 c.y. @ $2.31/c.y. = $349,000
   Alt 2 46,000 c.y. @ $2.31/c.y. = $106,000
   Therefore, local sponsor dredging cost is $243,000 LESS for Alt 2.

2. North Breakwater Rock Quantities.
   Alt 1 71,000 c.y.
   Alt 2 76,000 c.y.
   Therefore, Alt 2 requires approx 5,000 c.y. more rock = 8,000 tons @ $20/T = $160,000 more for North Breakwater. This is cost shared 90 % Fed/10 % local. Therefore, local sponsor additional cost is approx $16,000.

3. Alt 2 reduces the number of access floats from 5 to 4. This reduces electrical, water, fire and other utility requirements.

4. Total number of 45 ft slips remains essentially unchanged - 252 for Alt 1 and 254 for Alt 2.

5. Access Channel width of 100 ft in Alt 1 is excessive. An access channel width equal to 1.5 to 1.75 times boat length is recommended by the Permanent International Association of Navigation Congresses (PIANC). Accordingly, Alt 2 uses an access channel width of 80 and 90 feet (assuming 45-50 ft vessel length.) NOTE: 1.75 was used for the Anacortes Harbor (Cap Sante) commercial fishing marina expansion study by the Corps.

6. Extension of the commercial pier is required in Alt 2, but doing so provides moorage for an additional 175 ft long vessel.

7. Alt 2 requires very little dredging (less than 0.1 acres) of the intertidal area of greatest concern (-2 ft to +2 ft MLLW).

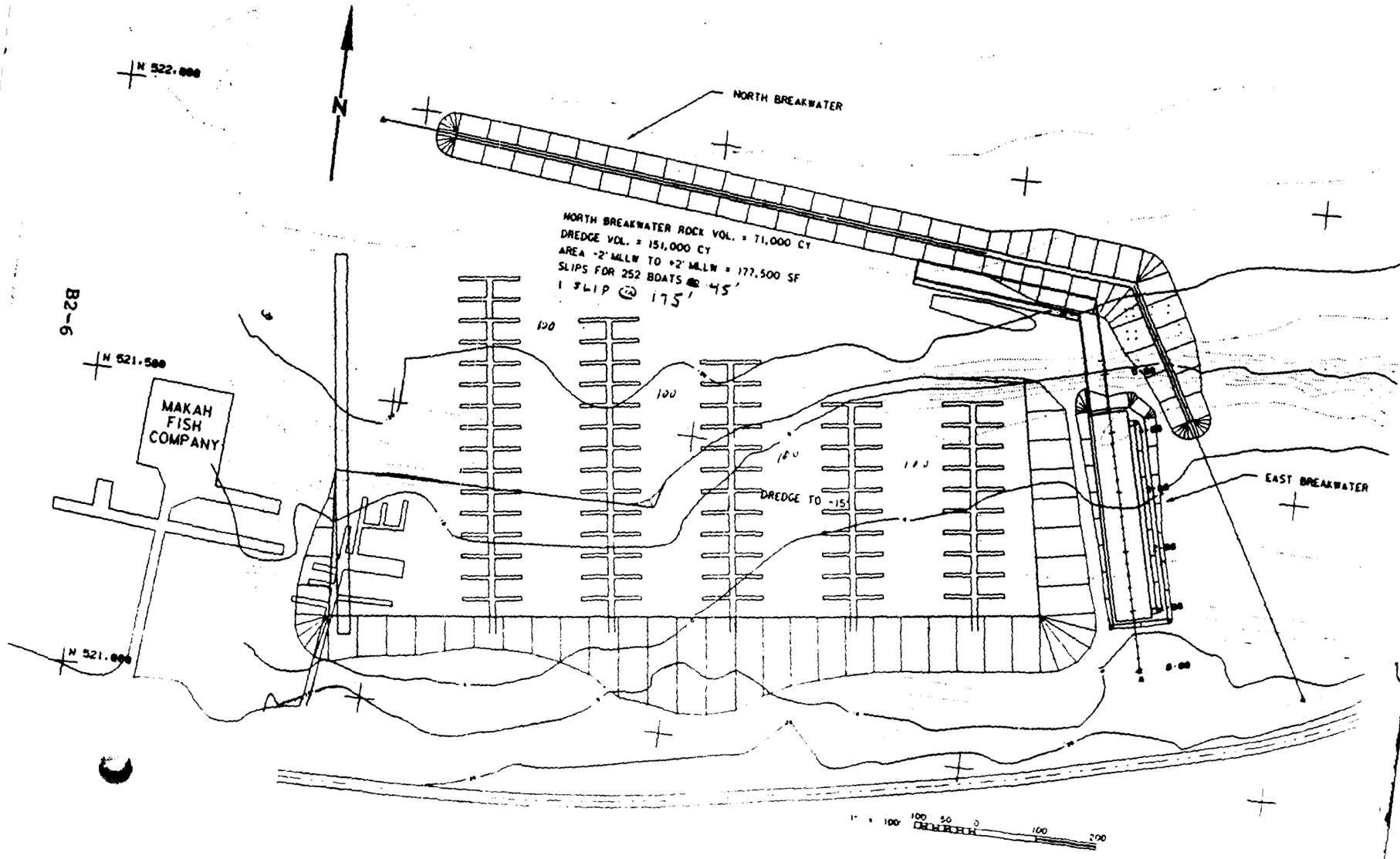
8. Alt 2 rotates the bridge pontoon approx 10 degrees but should not affect construction costs.

9. Alt 2 provides slightly better protection for the Makah Fish Company Dock.

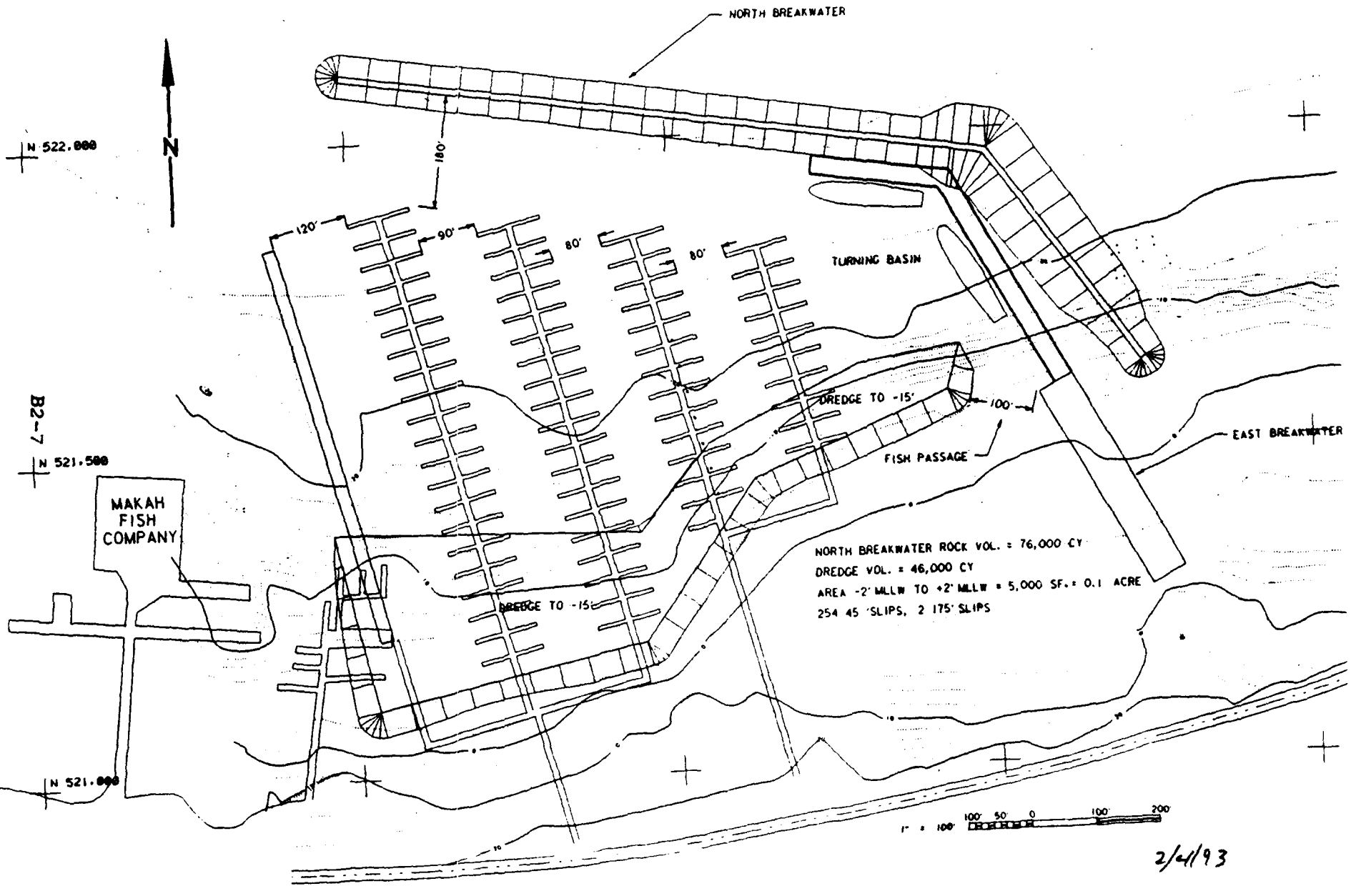
The above advantages of Alt 2 appear to make it the preferred layout.

Eric Nelson
Hydraulic Engineer
4 Feb 1993

ALTERNATIVE # 1



ALTERNATIVE # 2



2/4/93

MAKAH TRIBAL COUNCIL

P.O. BOX 115 • NEAH BAY, WA 98357 • 206-645-2201

February 8, 1993

U.S. Corps of Engineers
Engineering Division
P.O. Box C 3755
Seattle, WA 98124

ATTN: Joanne Green

SUBJECT: Changes to Proposed Marina Layout as a Result of Agency Concerns

REFERENCE: U.S. Corps of Engineers Letter Dated February 4, 1993, Same Subject

Dear Ms. Green:

In response to the reference letter, the Makah Tribe agrees that alternate #2 approach appears to be the preferred layout. We agree that you should provide the revised layout to the participating agencies and proceed with the mitigation process.

Sincerely,

George Hottowe
Marina Project Director

MAKAH TRIBAL COUNCIL

P.O. BOX 115 • NEAH BAY, WA 98357 • 206-645-2201

April 26, 1993

Ms. Joanne Green
U.S. Corps of Engineers
P.O. Box 3755
Seattle, WA

SUBJECT: Revision to Makah Coastal Zone Management Program (CZM) dated 1980

Dear Ms. Green:

Subject CZM program is hereby revised as follows:

> Page 79-2 layout of Neah Bay is revised by incorporation of the planned Neah Bay breakwater and marina . Please see the attached revised layout dated April 26, 1993 and incorporate it into any copies you may have of the subject CZM program.

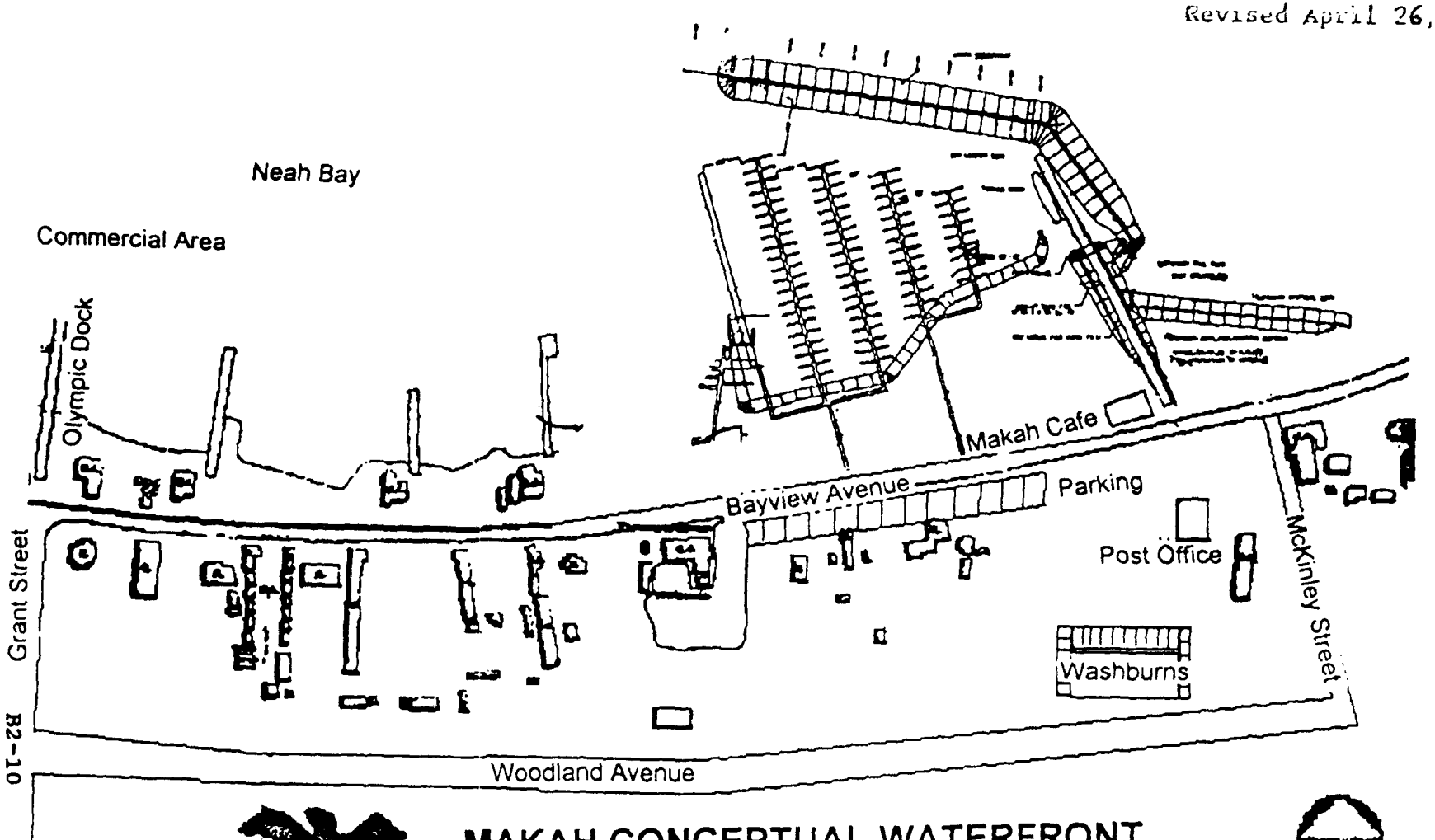
The revised layout and plan will be authorized by formal Makah Tribal Council resolution.

Sincerely,

Makah Tribal Council

George C. Bowechop
Chairman

Revised April 26, 1995



MAKAH CONCEPTUAL WATERFRONT

DEVELOPMENT PLAN

COPY

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-2255

REPLY TO ATTENTION OF

NOV 23 1993

Planning Branch

Dr. Robert G. Whitlam
Washington State Archaeologist
Department of Community Development
Office of Archaeology and Historic Preservation
111 West 21st Avenue, KL-11
Olympia, Washington 98504-5411

Dear Dr. Whitlam:

This letter concerns the Neah Bay Navigation Improvement Study Project. The Makah Indian Tribe proposes to build a 200 slip marina with assistance from the Corps of Engineers. Approximately 50,000 cubic yards (cy) of sediment will be dredged from the boat basin to a depth of -15 feet mean lower low water (MLLW). A 1,450 foot rubblemound breakwater will be at the north end of the marina and a 350 foot long cement pontoon (a fragment of the old I-90 Lake Washington bridge) will be on its east side. Mitigation for the biological impacts of this project will involve the removal of Evan's Mole to the east of the project. This removal will allow sediment to move west and renourish the beach adjacent to the project.

On August 22, 1992, Seattle District staff archaeologist David G. Rice carried out field inspection of proposed project impact areas, including mechanical trenching to probe through landfill (enclosure 1). The investigation identified no prehistoric or historic cultural resources in the proposed impact areas. It is our opinion that the proposed project will have no effect on cultural resources that may be eligible for the State or National Register of Historic Places. Please notify us as soon as possible if you believe otherwise. If you have questions about the investigation or findings, please contact Dr. Rice at 764-3631.

/s/

Enclosure

Karen S. Northup
Chief, Environmental Resources Section

MAKAH TRIBAL COUNCIL
P.O. BOX 115 • NEAH BAY, WA 98357 • 206-645-2201

August 25, 1993

Colonel Walter J. Cunningham
District Engineer
Corps of Engineers, Seattle District
Post Office Box 3755
Seattle, Washington 98124-2255

Dear Colonel Cunningham:

The Makah Tribal Council has reviewed the Draft Detailed Project Report and Environmental Assessment on Neah Bay Navigation Improvements, dated August 1993, and approves of the recommended plan. Makah planners have been actively involved with the Corps' staff in developing the plan and cost estimates for the proposed breakwater and marina. The Tribe is fully aware of its responsibilities as local sponsor and is prepared to proceed with negotiating a draft Project Cooperation Agreement.

We understand the cost sharing requirements of Public Law 99-662 and are prepared to provide up front a cash contribution of ten percent of the cost of the general navigation facilities plus an additional 10 percent (reduced by credit for lands provided by the Tribe) to be provided immediately after construction or over time. We are pursuing funding sources for the construction of the marina facilities concurrent with breakwater construction.

The Makah Tribe sees the proposed marina as an excellent investment in our future economic development. We look forward to continued cooperation with the Corps in completing the planning, design, and construction phases of the project.

Sincerely

MAKAH TRIBAL COUNCIL

George C. Bowechop
Chairman

APPENDIX B - PART 3

FISH AND WILDLIFE COORDINATION ACT REPORT

AND

CORPS OF ENGINEERS RESPONSES TO

U.S. FISH AND WILDLIFE SERVICE RECOMMENDATIONS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
3704 Griffin Lane SE, Suite 102
Olympia, Washington 98501-2192
(206) 753-9440 FAX: (206) 753-9008

September 28, 1993

Colonel Walter J. Cunningham
District Engineer
Seattle District, U.S. Army Corps of Engineers
P.O. Box C-3755
Seattle, WA 98124

Attn: Ms. Linda Cox, Environmental Resources Section

Re: Revised Draft Coordination Act report for the Neah Bay Marina Project

Dear Colonel Cunningham:

Enclosed for your review and comment is our revised draft Coordination Act Report (CAR) on the *Neah Bay Marina Project*. The Service provided a draft CAR in early April 1993. The revised draft report incorporates the changes in the proposed project design, as well as new project information. It is being provided under the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661, *et seq.*) and when finalized will fulfill Section 2(b) of this Act.

We would also appreciate knowing which of our recommendations you concur with, as well as your rationale for the recommendations you do not support, if any.

Copies of our report are being provided concurrently to the appropriate resource agencies for their review and comment.

Sincerely,

David C. Frederick
State Supervisor

gg/lk
Enclosure
c: EPA, Seattle (Justine Barton)
NMFS, Portland
USFWS-RO, Portland (Peggy Kohl)
WDE, Olympia (Sandi Manning)
WDF, Port Orchard (John Boettner)
WDW, Port Angeles (Tim Rymer)

Revised Draft
Fish and Wildlife
Coordination Act Report

NEAH BAY MARINA PROJECT

Prepared for
U.S. Army Corps of Engineers
Seattle District

Prepared by
Gwill Ging, Biologist
U.S. Fish and Wildlife Service
Ecological Services
Olympia, Washington

September 1993

CONTENTS

INTRODUCTION

This revised Draft Coordination Act Report (CAR) presents the U.S. Fish and Wildlife Service's (Service) conclusions on the impacts to fish and wildlife resources that can be expected to occur if a marina for commercial fishing vessels is constructed at Neah Bay, Washington. It also includes our mitigation recommendations for those impacts that cannot be avoided. The Service's evaluation is based on the project design, as provided with the Corps of Engineers' February 22, 1993 transmittal and their response to our draft CAR. This revised Draft CAR is being provided under the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661, *et seq.* and when finalized will fulfill Section 2(b) of this Act.

PROJECT LOCATION AND SETTING

Neah Bay is located along the southern shore of the Strait of Juan de Fuca near the northwest tip of Washington State's Olympic Peninsula, in Clallam County. It is approximately 75 miles west of Port Angeles, which is the largest city in Clallam County (Figure 1). The town of Neah Bay is the principal village of the Makah Indian Reservation which includes about 23,000 acres as well as the entire shoreline of Neah Bay.

The region remains substantially undeveloped, with the Olympic National Forest and Park encompassing a large portion of the peninsula. Forestry, fishing, and tourism are the major industries of the area. A heavily used marine traffic route follows the Washington coast past the project area.

The southern shore of Neah Bay is largely developed, occupied by housing, restaurants, Tribal supported functions (headquarters, senior citizens center, teen center, alcohol treatment center), marina and fishing support facilities. Less than one-half mile of the Neah Bay shoreline is still undeveloped.

The Makah Indian Reservation consists primarily of rugged, mountainous terrain that is characteristic of the Olympic Peninsula. Elevations generally range between 500 and 1000 feet, and reach almost 2000 feet at Sooes Peak.

The climate of Neah Bay is heavily influenced by its proximity to the Pacific Ocean and its location near the northwest corner of the Olympic Mountain Range. As a consequence, Neah Bay has moderate year-round temperature (seasonal mean daytime temperatures vary between 40-60 degrees), receives an average of 100 inches of rainfall annually, and frequently has intense east-west storms during the October through March period (Corps, 1968).

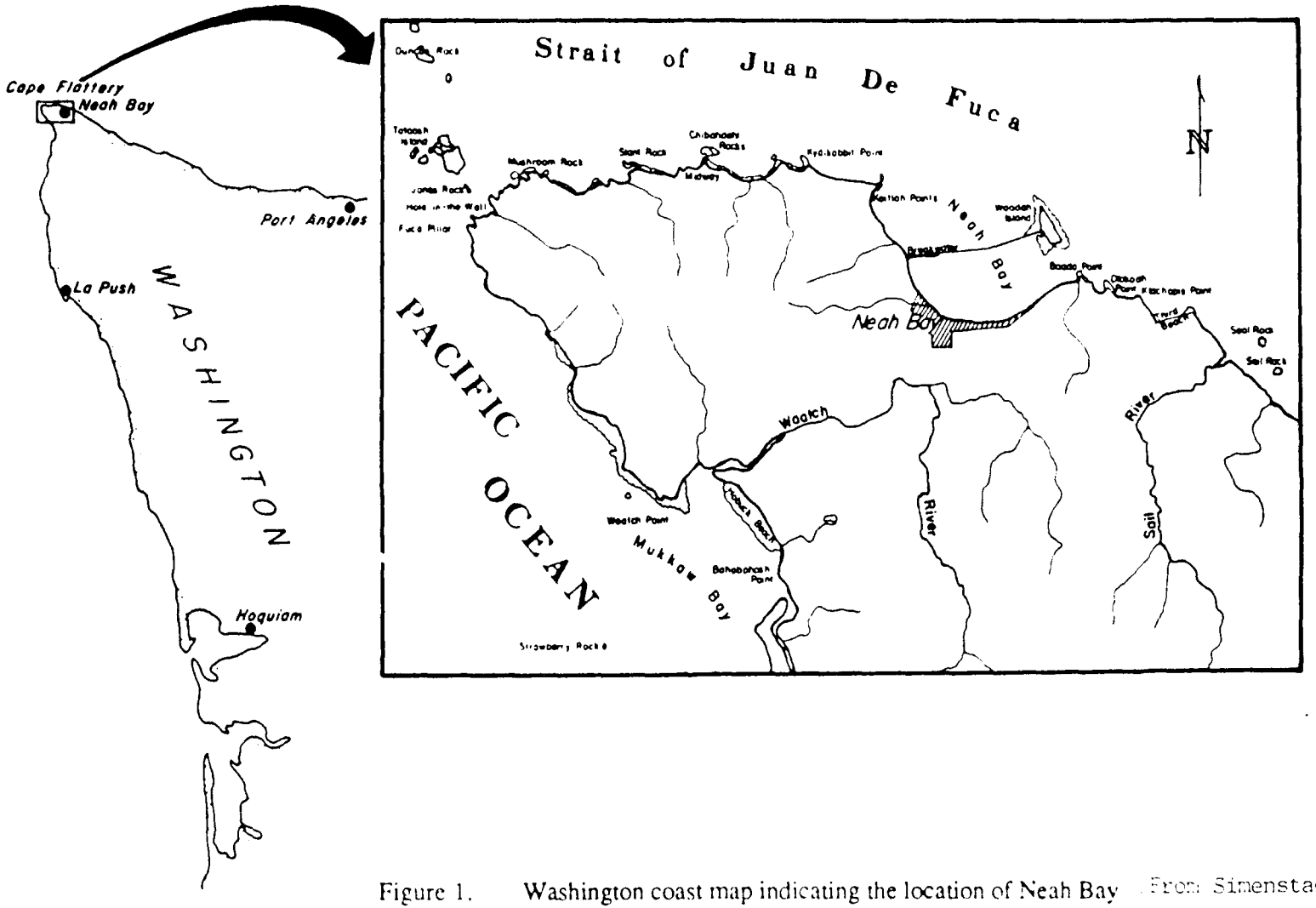


Figure 1. Washington coast map indicating the location of Neah Bay. From Simenstad et al. 1979

The Strait of Juan de Fuca is a glacially-formed submarine valley extending approximately 80 miles from its Pacific Ocean entrance at Cape Flattery east to the San Juan Archipelago. The Strait is approximately 12 miles wide, and is a U-shaped channel with relatively steep sides. It is bounded on the north by Vancouver Island and the Seymour Range. Pressing closely to the southern shoreline are the Olympic Mountains and foothills. Natural bays and harbors are few in number along this coastline.

Neah Bay has a natural crescent shaped embayment, about 2.5 miles long and 1.5 miles wide, protected on the west and south by the mainland and on the north by Waada Island and by a federally constructed 8000-foot long rubblemound breakwater. The mouth of the bay is about 1,500 feet wide, which exposes the bay to waves from the northeast.

Neah Bay is a fairly exposed gravel beach (mixed coarse habitat) with a foundation of boulders, gravel and coarse sand, in an environment of moderate to high energy, and with moderate to shallow slopes (Smith 1976, WDNR 1977, Cross et al. 1978, WDE 1979). As is typical of most bays along rocky shorelines, Neah Bay is sheltered to some extent from winter storms by rocky promontories or headlands and does not exhibit the dramatic extremes of beach cycling. Littoral drift within the harbor and behind the breakwater appears to be in a westerly direction along the inside shore. Sources of sediments to the bay are limited, but would include the westward transport around Baadah Point and input from the three small creeks (Agency, Halfway and Village Creeks) that enter the bay. At least a portion of the coarser sediments that now occur within the intertidal zone near Evans Mole appears to have come from the dredging of boat berths along the U.S. Coast Guard pier.

The three small creeks that enter Neah Bay drain very small watersheds, and their combined summertime flow totals less than 1 cubic foot per second. Agency and Village Creeks support very limited runs of coho and chum salmon and steelhead trout. Occasional plants of hatchery reared coho and chinook salmon into these streams have been made by the Makah Tribe.

The west end of Neah Bay formerly was used as a log dump and booming facility. As a result of this operation, a significant acreage of the intertidal and subtidal zones is covered by debris and decomposing woodwaste. At some locations, the organic layer has been found to be at least a couple of meters thick (Shreffler 1993).

PROJECT BACKGROUND

Other federal projects have been constructed at Neah Bay. The first federal project was authorized and constructed in the 1940's, and involved the construction of an 8000-foot long stone breakwater

connecting the mainland on the west with Waada Island to the east. In 1954, the existing project was modified to include both the reinforcement of an existing 1,800 foot-long rock revetment extending westward from Baadah Point and the addition of a 1,200-foot long rock revetment extension. In 1990, rock revetment was placed on an additional 1,200 foot-long section near Evans Mole to protect the main frontage road in Neah Bay because of the loss of the adjacent beach from erosion.

Since the 1960's the Makah Indian Tribe (Tribe) has sought assistance to construct a year round marina. The Tribe's previous proposals have also included other developments such as a log rafting and export facility and a deeper entrance channel to accommodate larger vessels. These earlier proposals did not receive federal support because they did not satisfy the federal justification criteria. In the mid-1980's, three alternative marina sites in Neah Bay were evaluated. The study results indicate the Tribe's preferred marina location at Baadah Point would result in significant impacts to the marine environment, and therefore would not likely receive the concurrence of the resource agencies. The Tribe did not support the development at either of the two alternative sites (Evans Mole or Crown Zellerbach) and requested the evaluation of a fourth site located to the west of Evans Mole. It is this new site that is being addressed in this CAR.

PROJECT DESCRIPTION

The proposed project is being evaluated under the authority of Section 107 of the Rivers and Harbor Act of 1960, as amended (Small Navigation Project Authority). The preliminary project plan is to develop a full service commercial marina along the south shore of the Neah Bay. The project layout is shown in figure 2. The marina would accommodate an estimated 200 boats and would be dredged to achieve a minimum depth of 15 feet below mean lower low water (MLLW). The eastern side of the marina would be protected from the larger ocean waves by the placement of a 350-foot long, 60-foot wide, and 18-foot high concrete pontoon (formerly part of the Interstate 90 Bridge across Lake Washington). A 1,500-foot long rubblemound breakwater would be constructed to protect the north side of the marina from the smaller waves generated in the bay. The project design has been modified to eliminate the vertical pile component of the north breakwater, i.e., a 1000-foot long pile/plank section located on top of the rubblemound base and extending between elevations, -1 feet and + 18 feet, MLLW. Instead, the proposed north breakwater now consists entirely of rubblemound design, and as a consequence, must have a significantly larger base covering 4.7 subtidal acres. The top elevation of the east and north breakwater would be 16 feet and 18 feet above MLLW, respectively. Dredging the marina basin to achieve a minimum depth of 15 feet at MLLW would require the removal of about 50,000 cubic

yards of sand and silt. The disposal of the dredged material is proposed for the following uses: (1) ballast in the pontoon/east breakwater (14,000 cubic yards); (2) surface material to cover the quarry spalls on the marina side of the pontoon (1000 cubic yards); (3) surface material to cover the quarry rock on the east side of the pontoon (5,000 cubic yards); and (4) beach nourishment on the eroded beach located to the west of Evans Mole (30,000 cubic yards).

The removal of Evans Mole, an existing intertidal fill, is also being proposed as project mitigation. The rock would be reused in the construction of the marina breakwater. The core material would be left in place as beach nourishment, if suitable, or removed and disposed at a designated upland site on the Makah Indian Reservation.

The Makah Indian Tribe (Tribe) would provide all remaining project support facilities. Initially, the Tribe has proposed to provide floats (treated wood pilings, concrete floats, and aluminum ramps) for mooring 200 commercial fishing boats, and to provide services, including water, electric power, pump out and sewer connections. Fueling facilities would not be included as part of this project. Only minor repairs would occur at the marina, as boats would continue to use haul out and repair facilities at Port Angeles. Future expansion may include the following: (1) the construction of permanent moorage slips for an additional 28 vessels between the north breakwater and the floats located during the first stage; (2) the installation of a float for transient moorage along the west side of the marina basin; and (3) the construction of a pier adjacent to the north end of the pontoon for the loading/unloading of large vessels. The proposed marina support facilities have not been described in sufficient detail for the Service to provide more than general comments and recommendations at this time.

PROJECT PURPOSE

The purpose of the proposed project, as described by the Corps of Engineers, is to provide safe moorage for Tribal and non-Indian commercial fishing boats. The existing federal breakwater protects the harbor from northeast through northwest storm waves, except for occasional waves that overtop the breakwater. The harbor, however, is large enough to permit the generation of damaging waves from within. Also, the 1,500 foot wide harbor mouth exposes the harbor to waves generated from easterly and northeasterly storms.

The need for a protected marina at Neah Bay results from the changing scope of the commercial Indian and non-Indian fishery, from a one season, one target species activity, to a multi-species, year-around industry. Because Neah Bay is closer to the fishing grounds than other all season marinas, the construction of a marina

at this location would reduce travel time and fuel consumption, and allow for more actual fishing time.

Based on information provided by the Makah Indian Tribe, the proposed marina would also become the centerpiece of their master plan for economic development, which would bring in the needed outside revenues to improve the standard of living on the reservation.

FISH AND WILDLIFE RESOURCES

Previous Biological Surveys in Neah Bay

In connection with the Northern Olympic Peninsula Study in 1982, a deep-draft ship channel (primarily for log export) and three marina site options (Baadah Point, Evans Mole, Crown Zellerbach) were evaluated. As part of the evaluation, detailed studies were conducted and included the collection of site specific data on juvenile salmonids (Meyer et al. 1985), marine mammals (Calambokidis 1987), and on fishes and motile macroinvertebrates, epibenthos, pelagic zooplankton, benthic infaunal macroinvertebrates, marine macrophytes, and trophic relationships (Simenstad et al. 1988).

Simenstad et al. concluded that ". . . Baadah Point is the most diverse and productive for all the benthic, epibenthic, or demersal assemblages examined, nearshore demersal fishes, motile macroinvertebrates, epibenthos, benthos, and macroalgae; Evans Mole is somewhat less diverse and productive; and, Crown Z and the region at the head of the bay is the most depauperate and least productive except where eelgrass persists". Additionally, the authors of this study suggested that Neah Bay is a major nursery or rearing area for bait or forage fishes (herring, smelts, and sand lance) and other fish species (eg. English sole) that enter the bay during their early life stages.

The data collected at the Evans Mole and Crown Zellerbach sites are particularly applicable to the current marina proposal because these areas may be directly affected by one or more of the mitigation options, and because the Evans Mole site is close to the proposed site. The information provided by these earlier studies have varying degrees of applicability depending on the motility of the species involved and on the similarity of the habitats affected.

Birds

The Strait of Juan de Fuca - Puget Sound region is a crucial link in coastal marine habitats for the Americas. The area provides a wide variety of habitat for various migrants, winter residents, and breeding birds of the Pacific coast.

Certain areas of the Sound are of special importance to birds for nesting, roosting, and foraging. Eleven such areas have been identified by Manuwal et al. (1979). Two of these sites occur within the outer Strait of Juan de Fuca (Cape Flattery to Port Angeles); Tatoosh Island (a major nesting site); and the open waters of the Strait of Juan de Fuca (in summer and fall the Strait contains 85% of the common murre population of California, Oregon and Washington).

Within the general project area, several patterns of regional bird distributions can be identified. Essentially there are two major habitat types - open water and shoreline areas. The two have very different avian compositions.

Bird density in the open water habitat varies widely and with the season. Fall is the period of highest density, with the common murre comprising approximately 80 percent of the total. The winter period also has a high density with most species departing from the area in late spring and early summer. Lowest densities occur in the summer period, with the common murre again occurring in relatively large numbers. The fall and winter are the periods of greatest avian diversity.

Compared with the more inland areas of the Sound, the outer Strait of Juan de Fuca lacks the large, shallow, protected bays preferred by most waterfowl (Manuwal et al. 1979). As a result, waterfowl and other marine birds concentrate in only a few isolated bays in the outer Strait. Neah Bay and Clallam Bay to the east are considered to be important waterfowl areas. Both bays are adult bird concentration, overwintering, and migratory areas. Species found in these bays include seabirds (murres, puffins, auks, alcids), commorants, dabbling ducks (mallards, pintails, American widgeon), diving ducks (scoter, scaup, goldeneye), geese, grebes, swans, loons, herons, shorebirds, and Caspian terns.

There are three important marine bird breeding sites within the outer Strait of Juan de Fuca - Tatoosh Island, Seal Rock and Sail Rock. Most marine birds require inaccessible islands and cliffs, characteristics which all three of these sites possess. No other major colony sites are found in this area. Tatoosh Island is typical of outer coastal islands with storm-petrels, murrelets, tufted puffins and Cassin's auklets, and has approximately 1,000-5,000 breeding pairs. Seal and Sail Rocks have bird communities typical of sites farther eastward in the Sound. Glaucous-winged gulls, pelagic commorants, tufted puffins and pigeon guillemonts are the major species in this community. There are approximately 50-100 breeding pairs at these sites.

Extensive species lists for specific areas within the Sound are available in Manuwal et al. (1979), WDE (1977), Angell and Balcomb (1982) and from the Washington Department of Wildlife - Washington Natural Heritage Program and Nongame Wildlife Program.

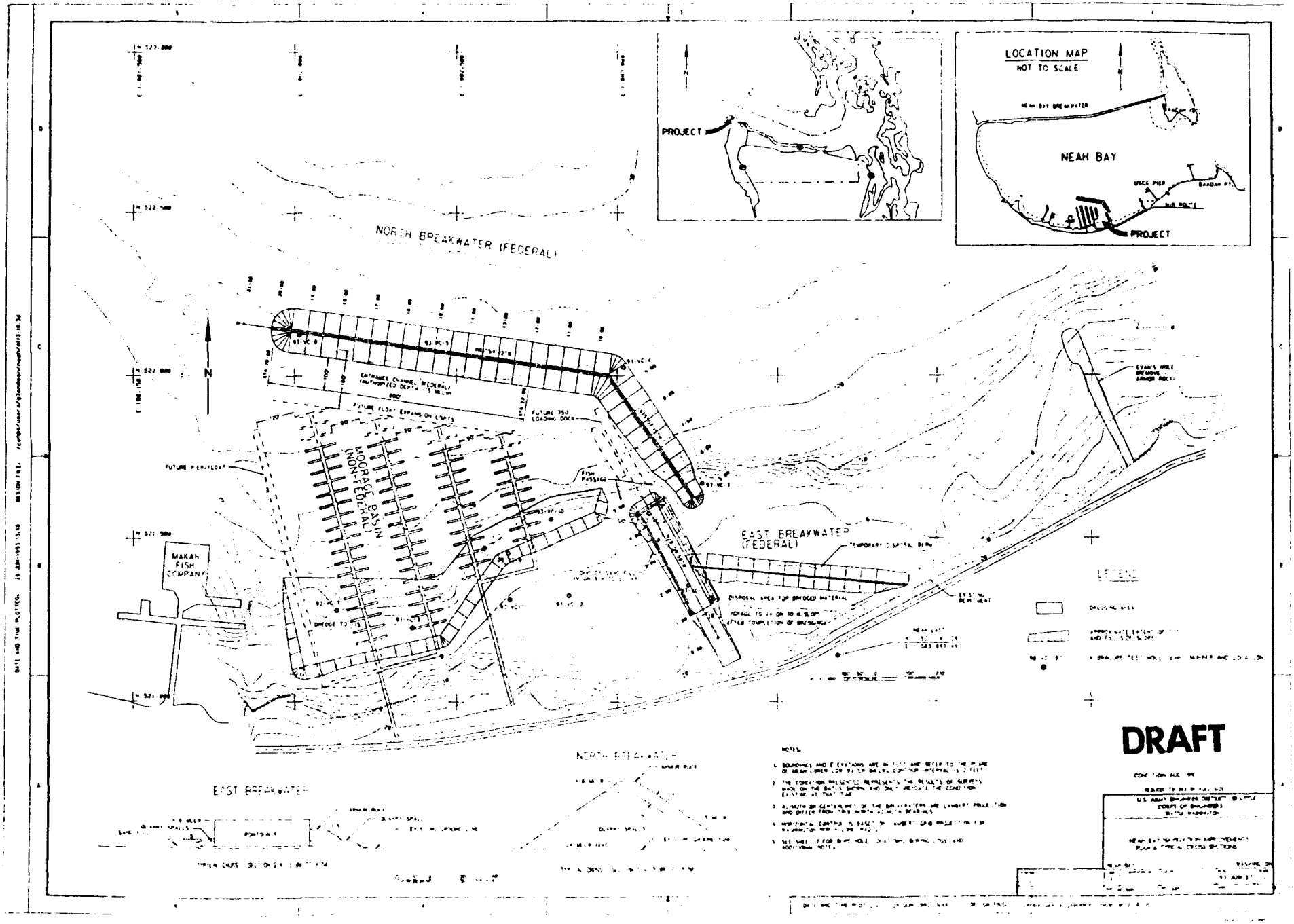


Figure 2. Project Layout

A year long census of the bird species found in or near the proposed marina site was conducted by the Makah Tribe beginning on March 19, 1992 (Donna Chapman, 1993). Observations were made at Evans Mole, the proposed marina site and at the western edge at intervals of two to three weeks. A summary of the observations is presented in Table 1. Of particular importance are the sightings of bald eagles and a peregrine falcon, listed as threatened and endangered, respectively, under the Endangered Species Act.

Table 1. Bird species observed in or adjacent to the proposed marina site (Adapted from Chapman 1993).

common loon	Gavia immer
red-throated loon	Gavia stellata
horned grebe	Podiceps auritus
western grebe	Aechmophorus occidentalis
double-crested cormorant	Phalacrocorax auritus
pelagic cormorant	Phalacrocorax pelagicus
great blue heron	Ardea herodias
greater scaup	Aythya marila
lesser scaup	Aythya affinis
common goldeneye	Bucephala clangula
bufflehead	Bucephala albeola
oldsquaw	Clangula hyemalis
white-winged scoter	Melanitta fusca
surf scoter	Melanitta perspicillata
black scoter	Melanitta nigra
red-breasted merganser	Mergus serrator
bald eagle	Haliaeetus leucocephalus
osprey	Pandion haliaetus
peregrine falcon	Falco peregrinus
killdeer	Charadrius vociferus
sandpiper sp.	Calidris sp.
gull sp.	Larus sp.
common murre	Uria aalge
pigeon guillemot	Cepphus columba
rhinocerous auklet	Cerorhinca monocerata
tufted puffin	Fratercula cirrhata
belted kingfisher	Ceryle alcyon
American crow	Corvus brachyrhynchos
European starling	Sturnus vulgaris

Fish

An assessment of fish utilization of the project area must be extrapolated from the data collected at Evans Mole (Meyer et al. 1985 and Simenstad et al. 1988) because no intensive sampling efforts have been conducted at the currently proposed marina site. The fish data collected at the Evans Mole site, however, should be fairly applicable because of the similarities of substrate and the

close proximity to the areas sampled in these earlier studies. In the Meyer et al. and Simenstad et al. studies, both beach and purse seines were used. Additional collections and observations were made by otter trawl and by SCUBA, respectively, in the latter study.

The Meyer et al. survey, conducted between May 3, 1984 and August 7, 1984, indicates that sand lance, herring, surf smelt, sculpin and flounder were common inhabitants of the Evans Mole intertidal zone, and Pacific herring was the dominant species caught in the nearby deeper water areas. Based on fish samples collected between May, 1986 and March, 1987, Simenstad et al. (1988) concluded the standing crop of intertidal fish to be dominated by Pacific staghorn sculpin, followed by surf smelt, and starry flounder. The dominant species taken by purse seine in the adjacent subtidal regions were Pacific herring and surf smelt. Meyer et al. (1985) suggested that sand lance and surf smelt utilize the sand and gravel beaches of Neah Bay for spawning. Simenstad et al. concluded that the bay is a major nursery or rearing area for herring, smelt, and sand lance.

Based on the few numbers of chinook, chum, pink and coho salmon caught during these two studies, it does not appear that Neah Bay is heavily utilized by juvenile salmonids as rearing habitat. The studies, however, were not designed to address nearshore migration. Consequently, the existing data on which to assess the importance of the project area as a migration corridor by juvenile salmonids is insufficient to draw firm conclusions on this issue.

A list of the fish recorded at the Evans Mole site during these two earlier studies is presented in Table 2.

Marine Mammals

The most recent and extensive survey of marine mammals in the vicinity of Neah Bay was conducted by Cascadia Research during the period, August 1985 to July 1986, under contract to the U.S. Army Corps of Engineers (Calambokidis et al. 1987). The purpose of the survey was to determine the occurrence of marine mammals between Tatoosh Island and Pillar Point for evaluating the potential effects of developing a log export facility, deepwater ship entrance and commercial marina at Neah Bay. During the year-long survey, nearly 800 sightings involving 10 marine and aquatic mammal species (including the river otter) were made in the study area. Of these, harbor seals, gray whales, northern and California sea lions, and river otters, were observed in Neah Bay, with the latter two species within the project site.

Based on recorded sightings and information provided by Eaton (1975), Everett et al. (1980) and Calambokidis et al. (1987), at least 24 species of marine mammals can be expected to occur in Neah Bay, the western Strait of Juan de Fuca, or adjacent northern Washington coastal waters (Table 3).

Table 2. Fish species found in or adjacent to the proposed marina site.[1]

American shad	Alosa sapidissima
Pacific herring	Clupea harengus pallasi
northern anchovy	Engraulis mordax
pink salmon	Oncorhynchus gorbuscha
chum salmon	Oncorhynchus keta
coho salmon	Oncorhynchus kisutch
chinook salmon	Oncorhynchus tshawytscha
surf smelt	Hypomesus pretiosus
true cod	Gadus macrocephalus
tube-snout	Aulorhynchus flavidus
striped seaperch	Embiotoca lateralis
blenny	Stichaeidae
penpoint gunnel	Apodichthys flavidus
cresent gunnel	Pholis laeta
saddleback gunnel	Pholis ornata
Pacific sand lance	Ammodytes hexapterus
quillback rockfish	Sebastes maliger
kelp greenling	Hexagrammos decagrammus
coralline sculpin	Artedius corallinus
silverspotted sculpin	Blepsias cirrhosus
sharpnose sculpin	Clinocottus acuticeps
buffalo sculpin	Enophrys bison
Pacific staghorn sculpin	Leptocottus armatus
great sculpin	Myoxocephalus polycanthocephalus
sailfish sculpin	Nautichthys oculufasciatus
tidepool sculpin	Oligocottus maculosus
cabezon	Scorpaenichthys marmoratus
snailfish	Cyclopteridae
speckled sanddab	Citharichthys stigmaeus
English sole	Pleuronectes vetulus
starry flounder	Platichthys stellatus
sand sole	Psettichthys melanostictus

[1]Compiled from Meyer et al. (1985) and Simenstad et al. (1988)

Table 3. Marine mammals reported from Neah Bay, the western Strait of Juan de Fuca, or northwest Washington coastal waters.[2]

Order Carnivora	
Suborder Fissipedia	
sea otter	Ehnydra lutris
river otter	Lutra canadensis
Suborder Pinnipedia	
northern fur seal	Callorhinus ursinus
harbor seal	Phoca vitulina
northern elephant seal	Mircunga angustirostris
California sea lion	Zalophus californianus
Stellar sea lion	Eumetopias jubatas
Order Cetacea	
Suborder Odontoceti	
common dolphin	Delphinus delphis
Pacific white-sided dolphin	Lagenorhynchus obliquidens
Risso's dolphin	Grampus griseus
harbor porpoise	Phocoena phocoena
Dall's porpoise	Phocoenoides dalli
killer whale	Orcinus orca
false killer whale	Pseudorca crassidens
Shortfinned pilot whale	Globicephala macrorhynchus
pygmy sperm whale	Kogia breviceps
north Pacific giant bottlenose whale	Berardius bairdii
Cuvier's beaked whale	Ziphius cavirostris
beaked whales	Mesoplodon spp
Suborder Mysticeti	
gray whale	Eschrichtius robustus
minke whale	Balaenoptera acutorostrata
Northern right whale	Eubalaena glacialis
Fin whale	Balaenoptera physalus
Humpback whale	Megaptera novaeangliae

Macroinvertebrates

Information on macroinvertebrate (bivalves, crab, shrimp) utilization within the project area is limited primarily to the 1992 intertidal and subtidal surveys conducted by the Corps of Engineers (Cox 1992) and Battelle/Marine Sciences Laboratory (Shreffler 1992), respectively. Earlier macroinvertebrate surveys did not include the current project site.

---

[2] Compiled from Eaton (1975), Everett et al. (1980), and Calambokidis et al. (1987)

In the Corps study (Cox 1992), a total of sixty samples were taken along fifteen transects during the August 24-28, 1992 period. Of the fifteen transects, 10 transects were located within the area of the proposed marina and 5 transects were located in areas to the east of the project site where the project is likely to affect the transport of sediment. The following conclusions were drawn from the results of this study: (1) the most diverse species composition of bivalves occurred within the 0 to -1 foot MLLW zone; (2) the most productive areas for bivalves were located to the east of Evans Mole, and along the east and west side of the project site; and (3) the horse clam (Tresus capax) was the most abundant bivalve observed, followed by four species of macoma clams (Macoma secta, M. balthica, M. inquinata, and M. nasuta), cockle (Clinocardium nuttali), butter clam (Saxidomous giganteus), littleneck clam (Protothaca staminea), Tellina modesta, and geoduck (Panopea generosa).

In the Battelle/Marine Science Laboratory study (Shreffler 1992), fourteen subtidal transects were surveyed during August 19-26, 1992. Of these, 11 transects were located within the proposed marina site, and 2 and 1 transects were located to the east and west of the site, respectively. The mean density of subtidal horse clams was 0.90, 0.33 and 7.92 per 10 square meters, within the surveyed portion of the project site, and to the east and west of the project site, respectively. Only two geoduck clams and very few Dungeness crab (Cancer magister; 0.043 per 10 square meters) were observed.

The earlier survey of the Evans Mole site, reported by Simenstad et al., identified three bivalve taxa (Parvilucina sp., Mysella sp., and Transennella tantilla) that were not found in the 1992 surveys. In contrast, the 1992 Corps'survey reported two taxa (butter clam and geoduck) that the 1986 survey failed to observe. Variations in sampling location and sampling intensity or changes in species abundance and distribution may be responsible for these differences.

Macroalgae

Only five algal taxa (sugar wrack Laminaria saccharina, sea lettuce Ulva sp., enteromorpha Enteromorpha intestinalis, gracilaria Gracilaria paciica, fauchea Fauchea sp.) were reported by Shreffler during his 1992 SCUBA surveys of the project area. He attributes the relatively low species diversity within the project site to the instability of the sediments. Fauchea sp. was the dominant algal taxa based on percent cover, followed by Ulva sp. and L. saccharina. The surveys verified the absence of eelgrass in the project area.

Endangered Species

A list of listed threatened and endangered species (Attachment A) that may be present within the area of the proposed project is included in Attachment A. The list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) urder Section 7(c) of the Endangered Species Act of 1973, as amended (Act). We have also enclosed a copy of the requirements for the Corps of Engineers' compliance under the Act (Attachment B).

Should the biological assessment determine that a listed species is likely to be affected (adversely or beneficially) by the project, the Corps of Engineers should request Section 7 consultation through this office. If the biological assessment determines that the proposed action is "not likely to adversely affect" a listed species, the Corps of Engineers should request Service concurrence with that determination through the informal consultation process. Even if the biological assessment shows a "no effect" situation, we would appreciate receiving a copy for our information.

Listed species may occur in the vicinity of the project. Therefore, pursuant to the regulations implementing the Act, impacts to listed species must be considered by the Corps of Engineers in a biological assessment. The results of the biological assessment will then determine if a consultation and/or conference is required.

The National Marine Fisheries Service should be consulted regarding the following federally listed species that fall under their jurisdiction: the gray whale (Eschrichtius robustus), the fin whale (Balaenoptera physalus), the humpback whale (Megaptera novaeangliae), the northern right whale (Balaena glacialis), the Stellar sea lion (Eumetopias jubatas) and the leatherback sea turtle (Dermochelys coriacea).

FUTURE WITHOUT THE PROJECT CONDITIONS

If the proposed marina project is not constructed, the Service assumes that the conditions and processes that presently occur at Neah Bay would continue. Specifically, without the proposed project: (1) the commercial fishing fleet would continue to be based at more secure harbors, eg. Port Angeles, that are further from the fishing grounds; (2) intertidal and subtidal areas within the marina site, and the fish and wildlife species these habitats support, would not be impacted by dredging, breakwater construction or water quality degradation associated with the marina; (3) wildlife species relatively intolerant to the increased noise and human activity would not be displaced; (4) the existing intertidal fill known as Evans Mole would not be removed, and this area would not be restored to tidal action; (5) the intertidal beach between Evans Mole and the proposed marina would continue to erode until it

reaches a ground elevation of about -3 feet MLLW; and (6) the degraded shallow subtidal habitat at the former Crown Zellerbach log rafting site would not be enhanced by capping the anoxic layer of decomposing woodwaste by the placement of a layer of clean material dredged from the boat basin.

FUTURE WITH THE PROJECT CONDITIONS

The following evaluation of potential impacts to fish and wildlife resources within and adjacent to the proposed project site is based primarily on the project design information that the Corps of Engineers provided with their February 22, 1993 memorandum, and their response to our April 1993, draft CAR. It is the Service's understanding that additional refinements in project design, details on the Tribe's marina support facilities, sediment analysis data, and other information will be provided by the federal and local sponsors after the Service's preparation of the revised draft Coordination Act report. Consequently, the effect of these additions or modifications on the resources of concern to the Service will have to be evaluated or addressed between the preparation of the revised draft and final reports.

Dredging

The dredging of the boat basin can be expected to impact fish and other aquatic resources, including bivalves, macroalgae, and epibenthic invertebrates, by direct contact or through permanent or reoccurring modifications to their habitat. Sessile or largely immobile biota can be injured or killed by the mechanical or hydraulic action of dredging. Plants and animals transported by dredging may not be able to survive in the different conditions of the disposal site.

The environment of the proposed disposal site is very different in terms of tidal elevation (intertidal versus subtidal) and water circulation. At least two other options (Crown Zellerbach and upland disposal) are being evaluated for the disposal of a portion of the dredged material. The environment of the upland disposal site would be inhospitable for displaced aquatic biota. At the Crown Zellerbach site, the tidal elevations would be more similar but the higher organic content of the receiving sediments and the presumed lower water quality would have an impact on survival. For all disposal options, predation is likely to be a factor. Injured or displaced crustaceans (crab, shrimp), juvenile fish, or polychaetes would be easy prey for avian predators and larger fish.

Construction of a boat basin to a depth of at least 15 feet MLLW would result in the permanent deepening of 1.8 acres of shallow subtidal and intertidal habitats, presently ranging between -10 feet and +2 feet MLLW. The assemblage of the macroalgae, epibenthos, and infaunal resources that would recolonize the

substrate of the boat basin following construction would include those species that are better adapted to the new depth, circulation pattern and the other environmental conditions specific to the boat basin. Generally, shallow subtidal and intertidal habitats are considered to be more productive than the adjacent deeper water habitats. Among the factors that affect productivity is the maximum depth to which photosynthesis would occur. The greater depth of the boat basin can be expected to reduce the photosynthetic production, at least along the bottom.

Maintenance dredging would result in periodic disruptions to the epibenthic and benthic communities, and to a lesser degree the water column biota (eg. fish) that would recolonize the area following construction or maintenance dredging. The frequency of maintenance dredging may preclude the establishment of older age individuals of such longer lived species as horse and geoduck clams. At this time, it is unclear how frequently maintenance dredging would be required. However, it is logical to expect that the impact to aquatic environment would increase with an increase in dredging frequency.

The modification of the marina design to take advantage of the existing deeper water of Neah Bay has reduced both the quantity of material that would need to be dredged from the boat basin and the amount of shallow water habitat (-10 to +10 feet MLLW) that would be directly impacted by dredging. The loss of this habitat, while relatively small, should still be fully mitigated.

Breakwaters and the Placement of Fill

The placement of a 350-foot long by 60-foot wide concrete pontoon along the eastern edge of the proposed marina would result in the direct loss of about 0.7 acres of intertidal habitat and the epibenthic and infaunal resources (eg. harpacticoid copepods, gammarid amphipods, bivalves, polychaetes) that it is expected to support. Data from transects that were adjacent to the pontoon alignment indicate this area supports low densities of bivalves (horse clams, cockles and two species of macoma clams) and other macroinvertebrates (polychaetes, ribbon worms, sand dollars) (Cox 1992). In addition, the water column over the 0.7 acre footprint of the pontoon would be removed from the tidal prism and would no longer be usable by fish, birds, or motile invertebrates.

The construction of the rubblemound breakwater along the northern edge of the project site would eliminate the utilization of about 4.7 acres of subtidal habitat, ranging between -2 feet and -25 feet in depth (MLLW datum). The studies conducted to date indicate that this area is relatively unproductive in terms of species diversity or abundance. The subtidal surveys conducted by Shreffler (1992) found primarily a red algae (Fauchea sp.) intertwined with chaetopterid worm tubes and barren substrate within the rubblemound breakwater alignment. A relatively small amount of the volume of

Neah Bay would be eliminated by the north breakwater. While this habitat would be lost, a completely different habitat would be created on the surface, along, and between the large rocks forming the breakwater. The rubblemound breakwater should provide new habitat for macrophytes that require a stable surface for attachment (eg. Fucus and Nereocystis) and for species that prefer structures with crevices and irregular surfaces (eg. ling cod, greenlings, rockfishes, octopus, and red rock crab). Mitigation measures are needed to accelerate the establishment of intertidal and subtidal macrophytes. For example, the production of Nereocystis luetkeana seed stock and "grow out" on long lines was used successfully at the Elliott Bay Marina Project (Jones and Stokes Associates 1992). A similar approach should be considered, as well as the use of other species of macroalgae.

The placement of fill material below the high water line (+10 feet MLLW) for the purpose of creating upland on which to locate marina support facilities, including parking, has been suggested. While these activities would not technically be considered part of the federal project, and therefore have not been included by the Corps in the project description, the Service still considers these proposals in our evaluation of the project. The filling of intertidal habitat would eliminate areas that are important to the overall ecosystem, and the localized scarcity of macroinvertebrates or marine flora in the intertidal zone of the project site should not be taken as the sole indicator of its productivity. The literature contains an abundance of studies that substantiate the high productivity of the intertidal zone (Levy et. al. 1979, Herman, S. et al. 1981, Simenstad et al. 1981, Simenstad et al. 1988). While there have not yet been any formal proposals by the Makah Tribe for the placement of fill to create space for marina support facilities, this issue needs to be addressed at the onset so that both the federal and local sponsors are well aware of the Service's particular concern for the protection of intertidal and shallow water habitats. As stated at the January 20-22, 1993 Neah Bay site visit, the Service opposes the placement of fill for non-water dependent purposes, or when upland alternatives are available.

The proposed project may still have an impact on juvenile fish passage by impairing their nearshore migration and forcing these fish to move into deeper water or under docks and piers where the predation can be expected to be greater. However, the Service does not believe this impact will be significant because of the reconfiguration of the marina to avoid most of the shallow water habitat, the presence of a 50 foot wide opening between the north and east breakwaters to facilitate passage, and our expectation that any piers, docks or floats located in shallow water and greater than eight feet in width will be grated.

Piers, Docks, Floats, and Pilings

These structures can reduce the productivity of shallow water habitats by blocking the available light needed by aquatic plants for photosynthesis and by the leaching of toxic substances from treated wood. It may also interfere with the movement of juvenile fish because of a behavioral response related to predator avoidance. The shading issue is of greatest concern when the structure is greater than eight feet in width and when it is over water that has a depth that is less than ten feet at MLLW. Presently, only a portion of the pier (approximately 200 feet) leading to the north breakwater dock would be of concern with respect to hading.

However, these structures may improve productivity in other ways. The in-water surfaces of docks, piers, floats, and supporting piles provide a stable substrate that are often colonized by a variety of sessile organisms, including various algae, barnacles, and mussels. In turn, these species typically attract and support a wide variety of other marine species (eg. shiner seaperch, spider crab, and nudibranchs).

Avoidance/Disturbance

The presence of a 200-slip commercial marina, along with its support facilities, can be expected to reduce the use of the project area by avian and mammalian species that would be less tolerant of the increased noise and human activity. The biological surveys conducted to date indicate there is only moderate use of the project area by marine mammals, water birds, and shorebirds, and therefore the impact to these groups would be limited. With the project, the utilization of the area would likely decrease for such species as the bald eagle, common loon, old squaw, scaup, bufflehead, great blue heron, and California sea lion.

On the other hand, the marina with its breakwater, piles, piers and floats, offer feeding and observation posts for marine birds such as gulls, commorants, terns, and crows. Only a limited group of species would favor these habitats (generalists and species tolerant of man's activities); many other species would be displaced due to the habitat changes and increased activity.

DISCUSSION

The Service was not able to fully evaluate the proposed project because not all of the information on which to assess potential impacts to fish and wildlife resources was available prior to the preparation of this report. The collection and analysis of sediment cores from both the project area and potential mitigation sites has yet to occur. In addition, specific details regarding the Tribe's marina and associated support facilities are still

being developed. The impact of the Tribe's marina and support facilities must be included in the overall analysis and consideration of project impacts and required mitigation even though the Corps defines the federal project as being limited to the construction of the two breakwaters, the dredging of the boat basin, disposal of the dredged material, and the associated mitigation for the federal project components. The Service believes the National Environmental Policy Act requires the Corps to consider and address cumulative and indirect impacts in its project evaluation. Consequently, the Service's analysis, as described in this revised draft CAR, must be considered with the understanding that some important project related information was not available for the complete evaluation of the proposed project. The Service anticipates that the necessary project information will be provided and that our final CAR will be based on a fully detailed project description.

The Service can still provide the Corps with its views on certain aspects of the project, even though some details are still lacking. The Service is comfortable with the present location, depending on the final design selected and the development and implementation of a mitigation plan that is acceptable to the Service. Based on our review of the available biological information, the present marina site is preferred over both the Baadah Point and Crown Zellerbach alternatives. Baadah Point was found to be highly productive with a diverse and abundant marine assemblage. The Crown Zellerbach alternative, although the least productive of the sites evaluated, was unattractive because of the following reasons: (1) it would likely include proposals to fill intertidal and shallow subtidal habitats to locate marina support facilities because there are limited uplands adjacent to the site; (2) there would likely be water quality issues because of the reduced water circulation at the head of the bay, and the accumulated woodwaste on the bottom; and (3) it would result in a significant increase in human activity and disturbance to wildlife in an area which now receives only limited human use. Overall, the biological resources at the proposed site appear to be relatively similar with those of Evans Mole, but the former would involve less dredging because it takes advantage of the deeper area to the west. On the other hand, the location of a marina at the Evans Mole site has the advantage of an already constructed east breakwater, which would reduce the project's impact on the intertidal zone if the other aspects of the project design were similar. The Tribe has stated that it does not support the location of the marina at Evans Mole because a number of residences would need to be relocated to provide sufficient space on which to locate its marina support facilities. However, the Evans Mole alternative has never been developed to a comparable level of detail on which to assess whether it would be better than the proposed site from a biological basis.

The current project design, i.e., alignment of the breakwaters and boat basin, is a vast improvement over earlier designs at this

location from the standpoint of reducing impacts to intertidal and shallow subtidal areas (-10 feet to +10 feet MLLW), habitats of particular concern to the Service. The present marina design reduces the impact to these areas to .8 acres and 1.8 acres of intertidal and subtidal habitat, respectively. The boat basin has been relocated to take advantage of the existing deeper water so that now only .1 acres of intertidal habitat would be impacted by this project component. The construction of the east breakwater by grounding an existing concrete pontoon would result in a smaller intertidal impact (.7 acres) when compared to the rubblemound alternative (Eric Nelson 1993). The removal of Evans Mole is the proposed intertidal mitigation and would result in the restoration of an equivalent acreage of intertidal habitat. However, the removal of Evans Mole can be expected to change the conditions influencing the local transport and deposition of sediments and result in erosion and deposition to the beaches east and west of Evans Mole, respectively, as the beach contour becomes more uniform. The limited source of sediments to Neah Bay and the considerable beach erosion that has already occurred immediately east of the proposed project suggest that some additional measures are needed to moderate the effect of removing Evans Mole. For this reason, a placement of dredged material on the eroded intertidal beach immediately east of the project is being considered. This issue needs to be refined in much greater detail in terms of target ground elevations following placement, method of application, and quantity of material involved. It is anticipated that approximately 30,000 cubic yards of dredged material would be available for beach restoration. If the analysis of sediment cores indicates that there are layers or pockets of gravel, shell and coarse sand within the proposed boat basin that would be dredged, provisions should be included so that the coarser material could be isolated and used for beach nourishment.

It will also be necessary to determine from the sediment data whether the sediments proposed for dredging within the boat basin are free of contaminants, and therefore suitable for in-water use or disposal. Based on preliminary information provided by the Corps, the sediments are expected to be suitable for in-water use or disposal. However, if certain areas are found to be contaminated, sediments from those areas should be used for in-pontoon containment or disposed at an appropriate location. It is anticipated that about 14,000 cubic yards of sediments would be needed for filling the pontoon.

The only option thus far identified for mitigating "in-kind" the loss of about 1.8 acres of shallow subtidal habitat involves capping equivalent depth habitat at the former Crown Zellerbach site that is degraded because of the thick layer of decomposing woodwaste. This alternative has not been developed in much detail because the sediment cores have yet to be collected and analyzed and the availability of dredged material still needs to be quantified. Information provided by Shreffler (1993) indicates

that in some areas of the Crown Zellerbach site, the decomposing organic layer may be at least 6 feet thick. This alternative needs to be developed further before it can be evaluated and compared with other mitigation options.

The removal of beach material for upland development has the potential to adversely affect the beach to the east of the project. It is probable that the Tribe's practice of removing beach material has contributed to the loss of the intertidal beach and the resultant need to place revetment along the waterfront road. In view of the general consensus that the littoral transport of sediment into Neah Bay is limited, the protection of the mitigation area and adjacent intertidal habitats will require that the practice of removing beach material be curtailed.

In the event there is excess dredged material beyond the quantities that are needed for project construction and mitigation, the disposal of this material should not be allowed to impact wetlands or other productive fish and wildlife habitats. The Service opposes the use of this material for filling intertidal habitat and wetlands to locate marina support facilities and residences, respectively. Appropriate disposal sites need to be identified if upland disposal is proposed.

The current project design includes the following measures to minimize impacts to migrating juvenile fish: (1) a fifty foot wide opening between the north and east breakwaters; (2) siting the boat basin to avoid intertidal areas; (3) creating a gradually sloping sandy beach adjacent to the east breakwater; and (4) using grating on piers or docks which exceed 8 feet in width if located over water less than 10 feet in depth at MLLW. It should be noted that some maintenance (i.e., sediment removal) of the gap between the two breakwaters is anticipated. The incorporation of these measures in the project design would address the Service's concern with regard to fish passage past the proposed project. While an unbroken migration path along the shoreline (i.e., an opening between the shore and the east breakwater) would be preferred, the expected shoaling and the frequent maintenance that would be required makes this option less desirable.

The Service does not believe there would be significant water circulation problems within the marina owing to its location along the mid-bay shoreline, the flushing of Neah Bay, the multiple entrances, and the large size of the west facing entrance.

The marina is not expected to have a significant impact on the aquatic environment by its shading effect, based on our understanding that floats, docks and piers that are located in shallow water (i.e., less than -10 feet in depth at MLLW) and exceed eight feet in width would be grated.

The Service can only provide a cursory analysis of the Tribe's marina support facilities at this time because the information that has been provided to date has been lacking in site specific detail. This information is needed before we can complete our evaluation of the project and fulfill our Coordination Act responsibilities. The following discussion is based on the limited information provided to date.

It is the Service's expectation that the Makah Tribe will be able to include mitigative measures to satisfy our concerns relative to the development of their marina support facilities. We have the following observations and comments to offer at this time.

The Service has concern with the following potential impacts of the project with regard to water quality, if adequate safeguards or provisions are not included: (1) the entry into the marine environment of spilled fuels and other petroleum products from storage and refueling areas, bilges, boat washing and runoff from parking areas; (2) the entry of antifouling paints and wastes from maintenance yards; (3) the leaching and sloughing of antifouling paints from boat hulls while moored in the marina; (4) the leaching of creosote or other preservatives from piles, docks or other structures; (5) the disposal of fish carcasses in the boat basin and its resultant effect on dissolved oxygen levels; (6) the discharge of sewage from boats; and (7) reduced water circulation within the project because of the two breakwaters and other marina structures.

The location and design of boat maintenance and repair yards, including areas for hull scraping and painting areas, need to include provisions to prevent waste materials, paints and solvents from entering Neah Bay. Measures to limit and treat runoff containing oil, grease, solvents or other contaminants need to be addressed. Source control and containment measures need to be considered early in the planning process and included in the project design.

Within the marina, the use of inert materials, such as recycled plastic or concrete, should be considered. Sewage pumpout facilities need to be accessible and convenient to encourage their use. Refueling facilities need to include automatic shutoff devices and should be located to minimize accidental spills. While leaching may be considered an unavoidable impact, the in-water scraping of boat hulls is avoidable and should be prohibited.

Concerns have been raised regarding the secondary impacts of the project on migratory seabirds, including the federally listed marbled murrelet, which can be tangled in gillnets and drown. The project would facilitate commercial fishing by providing more actual fishing time, i.e., by reducing the time in transit, and by providing new moorage. The Corps believes the proposed project's effect on seabirds would be tempered by the type of fishing vessels

that would use the marina (i.e., no increase in the number of gillnetters) and by the fact that gillnetting does not occur to a large degree during the winter when the local abundance of seabirds is higher. At this time, the Service still believes there is insufficient information on which to evaluate the effect of gillnetting on migratory seabirds, including the marbled murrelets or the increase in the "take" of murrelets that would be attributed to the new Neah Bay marina. The evaluation of this issue may include the implementation of an observer program.

CONCLUSION

The construction of a 200-slip commercial marina at Neah Bay, as it is presently described, would not be expected to result in such serious impacts to fish and wildlife resources that the Service would recommend that it not be developed. This conclusion is premised on the assumption that the final design will include measures to minimize impacts to shallow subtidal and intertidal habitats, and that a mitigation plan that is acceptable to the Service will be developed and implemented. Furthermore, the Service has assumed that the Tribe's marina support facilities, which have yet to be described in detail, would not cause unacceptable impacts. In recognition that the project design will continue to evolve, the Service's position on the acceptability of the project may change to reflect the final design and the mitigation ultimately proposed by the federal and local sponsor. The Service expects to continue to work closely with the Corps and the Makah Tribe during this planning process.

RECOMMENDATIONS

1. The federal project, including the construction of two breakwaters, a 200 boat basin, and the disposal of approximately 50,000 cubic yards of dredged material, should be designed to avoid to the maximum extent possible impact to shallow subtidal and intertidal habitats. Modifications in project size and location, i.e., should be considered to further reduce the effect of the proposed project on these habitats.

2. The use of creosote or other preservative treated wood piles and planking should be restricted to those applications within the marina where structural requirements preclude less damaging alternatives. Inert materials, eg. recycled plastic, concrete, or rock should be used in lieu of treated wood because of the leaching of contaminants into the aquatic environment.

3. Piers, docks and floats that exceed eight feet in width and would be located over water that is less than 10 feet deep at

MLLW, need to be grated to reduce the effect of shading on primary productivity and on migrating fish.

4. The intertidal fill, locally known as Evans Mole, should be removed to offset the impact to the intertidal loss that would occur from the construction (i.e., permanent grounding of a concrete pontoon) of the east breakwater.

5. The option of restoring an eroded beach (located between Evans Mole and the east breakwater alignment) with material dredged from the boat basin should be developed in greater detail. Provisions should be included to separate or isolate gravel and shell fragments for beach enhancement use. Information from the sediment cores taken from the boat basin should be used to map deposits of gravel or shell fragments, if they occur. Additional cores may be needed to further refine the extent of these deposits. Additional information is needed with regard to what changes to the beaches immediately to the east and west of Evans Mole can be expected over time in terms of slope and elevation following its removal, and under various sediment placement options (quantity and location).

6. Native vegetation should be re-established at the higher tidal elevations of the beaches, located to the south and east of the proposed boat basin.

7. The option of capping the degraded shallow subtidal habitat at the former Crown Zellerbach log rafting area should be developed in detail so that it can be compared with other mitigation options. This is the only option explored to date that would mitigate for the loss of shallow subtidal habitat.

8. Perching piles for bald eagles should be provided at an alternative location, eg. the breakwater connecting Waada Island, to mitigate the loss of piles that would be eliminated by the project.

9. Measures to accelerate the establishment of intertidal and subtidal macrophytes on the rubblemound breakwater should be included as a mitigation feature of the project. An approach similar to the one used at the Elliott Bay Marina should be considered, i.e., the production of seed stock and long-line "grow out".

10. A monitoring and contingency plan is needed to ensure that the fish and wildlife mitigation objectives are fulfilled.

11. Public educational signs and displays describing the mitigation measures and sites should be included.

12. Boat repair and maintenance areas, if included now or in the future, should be designed and include provisions to prevent

bottom paints, waste materials, oil, grease, solvents, and other contaminants from entering Neah Bay. Source control, directing runoff away from repair and maintenance areas, and the treatment of contaminated runoff should be included in the overall design. The scraping of boat hulls and the application of antifouling paints should be restricted to approved locations. No in-water scrapping should be allowed.

13. Runoff from parking areas should be treated before being discharged into the bay.

14. Sewage pumpout facilities should be provided and sited at locations which encourage their use.

15. Refueling facilities, if included in the future, should be designed and located to minimize accidental spills and allow for the containment of spilled fuels. Automatic shutoff valves should be included to minimize the amount of spilled fuel in the event of a hose break.

16. Best Management Practices for the marina and its related support facilities should be implemented.

17. The project sponsors should participate in the funding of an observer program to assess the effect of gillnetting on the federally listed marbled murrelet and other sea birds, if the project would result in the increase of fishing by gillnets.

18. The removal of sand from the beaches, both within and to the east of the east breakwater, should be prohibited because of the limited recruitment of beach material and the impact of removal on the proposed mitigation.

REFERENCES

Angell, T. and K.C. Balcomb. 1982. Marine birds and mammals of Puget Sound. University of Washington Press. Seattle, WA. 145 pp.

Calambokidis J., G.H Steiger and J.C. Cubbage. 1987. Marine mammals in the southwestern Strait of Juan de Fuca: natural history and potential impacts of harbor development in Neah Bay. Cascadia Research Collective. Olympia, WA. 103 pp.

Chapman, D. 1993. Neah Bay bird surveys, March 19, 1992 to March 18, 1993. Makah Indian Tribe. Neah Bay, Washington.

Cross, J.N., K.L. Fresh, B.S. Miller, C.A. Simenstad, S.M. Steinfort, and J.C. Fegley. 1978. Nearshore fish and invertebrate assemblages along the Strait of Juan de Fuca including food habits of the common nearshore fish: report of two years sampling. Marine Ecosystems Analysis Program, NOAA. Boulder, CO. 188 pp.

Eaton, R.L. (ed.). 1975. Marine shoreline fauna of Washington. WDG and WDE. Olympia, Washington. 594 pp.

Everitt, R.D., C.H. Fiscus, and R.L. DeLong. 1980. Northern Puget Sound marine mammals. NOAA, MESA, Seattle, Washington. 134 pp.

Herman, S. and J. Bulger. 1981. The distribution and abundance of shorebirds during the 1981 spring migration at Grays Harbor, Washington. U.S. Army Corps of Engineers, Seattle District. 64 pp.

Jones and Stokes Associates. 1992. Kelp mitigation and monitoring report. Bellevue, WA. 9 pp.

Levy, D.A., and T.G. Northcote. 1981. The distribution and abundance of juvenile salmon in marsh habitats of the Fraser River estuary. Tech. Rep. 25. Westwater Res. Ctr., Univ. British Columbia, Vancouver, Canada. 117 pp.

Manuwal, D.A., T.R. Wahl, S.M. Speich. 1979. The seasonal distribution and abundance of marine bird populations along the Strait of Juan de Fuca and North Puget Sound. Marine Ecosystem Analysis Program, NOAA. boulder, CO. 391 pp.

Meyer J.H., J. Blum, S. Dilley and R.S. Boomer. 1985. Distribution and abundance of juvenile salmonids in Clallam Bay and Neah Bay, Washington. U.S. Fish and Wildlife Service, Fisheries Assistance Office. Olympia, WA. 37 pp.

Nelson E. 1993. Personal communication. Seattle District, U.S. *Army Corps of Engineers. Seattle, Washington.*

Smith, L.S. 1976. Living shores of the Pacific Northwest. Pacific Search.Seattle, WA. 159 pp.

Shreffler D.K. 1992. Subtidal SCUBA surveys for the proposed commercial boat marina in Neah Bay, Washington, August 1992. Battelle/Marine Sciences Laboratory. Sequim, WA. 27 pp.

Shreffler D.K. 1993. Personal communication. Battelle/Marine Sciences Laboratory. Sequim, WA.

Simenstad, C.A., and D.M. Eggers, eds. 1981. Juvenile salmonid and baitfish distribution, abundance, and prey resources in selected areas of Grays Harbor, Washington. Final Rep. to Seattle Dist., U.S. Army Corps of Eng. Fish. Res. Inst., Coll. Fish., Univ. of Wash. Seattle, WA. FRI-UW-8116. 204 pp.

Simenstad, C.A., R.M. Thom, K.A. Kuzis, J.R. Cordell and D.K. Shreffler. 1988. Nearshore community studies of Neah Bay, Washington. Fisheries Research Institute, University of Washington. Seattle, WA. 200 pp.

U.S. Department of the Army, Corps of Engineers (Corps). 1968. Review of reports on navigation improvements - Neah Bay (Hoko River-Clallam Bay) Washington. 30 pp.

Washington Department of Ecology. 1979. Coastal zone atlas of Washington. Vol. 12 - Clallam County. Publication No. WDE 77-21-7. Olympia, WA.

Washington Department of Natural Resources (WDNR). 1977. Washington marine atlas. Vol. 3 - North coast waters. Olympia, WA. 22 pp.

APPENDIX A

ATTACHMENT A

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CANDIDATE SPECIES WHICH MAY OCCUR WITHIN THE VICINITY OF THE PROPOSED NEAH BAY MARINA PROJECT
1-3-92-SP-358

LISTED

Bald eagle (*Haliaeetus leucocephalus*) - wintering bald eagles may occur in the vicinity of the project from about October 31 through March 31.

There are two bald eagle nesting territories located at: T33N R15E S2 and T33N R15 S4. Nesting activities occur from about January 1 through August 15.

Brown pelican (*Pelecanus occidentalis*) - Brown pelicans may occasionally be found in waters near the project site, particularly during El Nino years.

Marbled murrelet (*Brachyrampus marmoratus marmoratus*) - Marbled murrelets may occur in the marine waters adjacent to the proposed project throughout the year.

Peregrine falcon (*Falco peregrinus*) - spring and fall migrant falcons may occur in the vicinity of the project.

Major concerns that should be addressed in your biological assessment of the project impacts to listed species are:

1. Level of use of the project area by listed species.

2. Effect of the project on listed species' primary food stocks and foraging areas in all areas influenced by the project.

3. Impacts from project construction (i.e., habitat loss, increased noise levels, increased human activity) which may result in disturbance to listed species and/or their avoidance of the project area.

4. Fffect of the project (eg., an increase in fishing by gillnetters) on the "take" of marbled murrelets.

PROPOSED

None.

CANDIDATE

None.

ATTACHMENT B

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7(a) AND 7(c) OF THE ENDANGERED SPECIES ACT OF 1973, AS AMENDED

SECTION 7(a) - Consultation/Conference

Requires:

1. Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2. Consultation with FWS when a federal action may affect a listed endangered or threatened species to ensure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the federal agency after it has determined if its action may affect (adversely or beneficially) a listed species; and

3. Conference with FWS when a federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or an adverse modification of proposed critical habitat.

SECTION 7(c) - Biological Assessment for Construction Projects *

Requires federal agencies or their designees to prepare a Biological Assessment (BA) for construction projects only. The purpose of the BA is to identify any proposed and/or listed species which is/are likely to be affected by a construction project. The process is initiated by a federal agency in requesting a list of proposed and listed threatened and endangered species (list attached). The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the species list, please verify the accuracy of the list with our Service. No irreversible commitment of resources is to be made during the BA process which would result in violation of the requirements under Section 7(a) of the Act. Planning, design, and administrative actions may be taken; however, no construction may begin.

To complete the BA, your agency or its designee should: (1) conduct an onsite inspection of the area to be affected by the proposal, which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or potential reintroduction of the species; (2) review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; (3) interview experts including those within the FWS, National Marine Fisheries Service, state conservation department, universities, and others who may have data not yet published in scientific literature; (4) review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; (5) analyze alternative actions that may provide conservation measures; and (6) prepare a report documenting the results, including a discussion of study methods used, any problems encountered, and other relevant information. Upon completion, the report should be forwarded to our Endangered Species Division, 3704 Griffin Lane SE, Suite 102, Olympia, WA 98501-2192.

---

* "Construction project" means any major federal action which significantly affects the quality of the human environment (requiring an EIS), designed primarily to result in the building or erection of human-made structures such as dams, buildings, roads, pipelines, channels, and the like. This includes federal action such as permits, grants, licenses, or other forms of federal authorization or approval which may result in construction.

USFWS RECOMMENDATIONS

1. The federal project, including the construction of two breakwaters, a 200 boat basin, and the disposal of approximately 50,000 cubic yards of dredged material, should be designed to avoid to the maximum extent possible impact to shallow subtidal and intertidal habitats. Modifications in project size and location, i.e., should be considered to further reduce the effect of the proposed project on these habitats.

2. The use of creosote or other preservative treated wood piles and planking should be restricted to those applications within the marina where structural requirements preclude less damaging alternatives. Inert materials, eg. recycled plastic, concrete, or rock should be used in lieu of treated wood because of the leaching of contaminants into the aquatic environment.

3. Piers, docks and floats that exceed eight feet in width and would be located over water that is less than 10 feet deep at MLLW, need to be grated to reduce the effect of shading on primary productivity and on migrating fish.

4. The intertidal fill, locally known as Evans Mole, should be removed to offset the impact to the intertidal loss that would occur from the construction (i.e., permanent grounding of a concrete pontoon) of the east breakwater.

5. The option of restoring an eroded beach (located between Evans Mole and the east breakwater alignment) with material dredged from the boat basin should be developed in greater detail. Provisions should be included to separate or isolate gravel and shell fragments for beach enhancement use. Information from the sediment cores taken from the boat basin should be used to map deposits of gravel or shell fragments, if they occur. Additional cores may be needed to further refine the extent of these deposits. Additional information is needed with regard to what changes to the beaches immediately to the east and west of Evans Mole can be expected over time in terms of slope and elevation following its removal, and under various sediment placement options (quantity and location).

6. Native vegetation should be re-established at the higher tidal elevations of the beaches, located to the south and east of the proposed boat basin.

7. The option of capping the degraded shallow subtidal habitat at the former Crown Zellerbach log rafting area should be developed in detail so that it can be compared with other mitigation options. This is the only option explored to date that would mitigate for the loss of shallow subtidal habitat.

8. Perching piles for bald eagles should be provided at an alternative location, eg. the breakwater connecting Waada Island, to mitigate the loss of piles that would be eliminated by the project.

CORPS OF ENGINEERS RESPONSES

1. The proposed marina project has been designed to avoid, to the maximum extent possible, impacts to intertidal habitats. For example, the marina was moved into deeper waters so less intertidal dredging would be needed and the moorage layout was rearranged to take advantage of deeper water. For more information see EA-11.8.a.1.

2. The Corps agrees that the use of creosote or other preservative treated wood piles and planking should be restricted to applications where structural requirements preclude less damaging alternatives. Information on alternative materials has been provided to the Tribe for inclusion in their marina design.

3. The Corps and the Tribe concur that piers, docks and floats that exceed eight feet in width and would be located over water that is less than ten feet deep at MLLW, need to be grated.

4. The Corps concurs that Evans Mole should be removed as part of mitigation and its provisions are included in the project plan.

5. See EA-12.3., D-7 and D-15.2.04, for details on beach restoration and slope changes. The Corps assumes the beach slope will revert back to its pre-Evans Mole slope of 1V on 20H. Separation of gravel and shell fragments from the dredge material for enhancement use would be impracticable and too costly. When dredged material is placed on the beach, natural wave action will wash fines away leaving coarser material.

6. The Corps concurs that natural vegetation should be re-established in disturbed areas of the higher tidal elevations. See EA-12.5. for more information.

7. See EA-13.8.b. for information on Crown Zellerbach experimental capping. The Corps does not support the capping of Crown Zellerbach because 1) there is no data to prove there is any dissolved oxygen or chemical contamination problem to warrant capping and 2) the dredged material available from the marina project would cap only about seven percent of the site, which is too small a percentage to provide any significant remediation. Lastly, the Tribe was not involved in the degradation of this site and thus the Corps and the Tribe believe it is not the responsibility of the Tribe to remediate the site.

8. There are a group of ten pilings in the area of where the pontoon will be placed that are used by bald eagles. Of these pilings, about two or three are actually used by the eagles. Approximately half of these pilings will remain after construction of the marina, thus leaving five pilings for the eagles to perch on. There are no plans to add additional perching piles at other locations.

9. Measures to accelerate the establishment of intertidal and subtidal macrophytes on the rubblemound breakwater should be included as a mitigation feature of the project. An approach similar to the one used at the Elliott bay Marina should be considered, i.e., the production of seed stock and long-line "grow out."

9. Because Neah Bay has predominantly a sandy bottom, there is a limited amount of hard substrate in the bay for macrophytes to attach to. With the construction of the breakwater, hard substrate will be added which will accelerate the establishment of intertidal and subtidal macrophytes. No additional measures to accelerate macrophytes are planned.

10. A monitoring and contingency plan is needed to ensure that the fish and wildlife mitigation objectives are fulfilled.

10. See EA-4 for information on the monitoring of the beach restoration. No contingency plan has been made because historical evidence shows that the beach will be restored by natural wave action with the mole removed.

11. Public educational signs and displays describing the mitigation measures and sites should be included.

11. The Corps agrees that educational signs and displays would be beneficial to the success of the mitigation project and should be included in the education program. See EA-13 for more information.

12. Boat repair and maintenance areas, if included now or in the future, should be designed and include provisions to prevent bottom paints, waste materials, oil, grease, solvents, and other contaminants from entering Neah Bay. Source control, directing runoff away from repair and maintenance areas, and the treatment of contaminated runoff should be included in the overall design. The scraping of boat hulls and the application of antifouling paints should be restricted to approved locations. No in-water scrapping should be allowed.

12. The proposed marina design does not include boat repair and maintenance areas. Maintenance of boats will be at established facilities, the closest being at Port Angeles.

13. Runoff from parking areas should be treated before being discharged into the bay.

13. All parking will be across the street from the bay. This distance should provide adequate drainage for runoff before being discharged into the bay. No other treatment is proposed.

14. Sewage pumpout facilities should be provided and situated at locations which encourage their use.

14. The Corps concurs that sewage pumpout facilities should be provided and situated at locations which encourage their use.

15. Refueling facilities, if included in the future, should be designed and located to minimize accidental spills and allow for the containment of spilled fuels. Automatic shutoff valves should be included to minimize the amount of spilled fuel in the event of a hose break.

15. No refueling facilities are proposed as part of this project. The existing facility will be used.

16. Best Management Practices for the marina and its related support facilities should be implemented.

16. The Corps concurs that these practices should be followed and a copy has been provided to the Tribe for incorporation.

17. The project sponsors should participate in the funding of an observer program to assess the effect of gillnetting on the federally listed marbled murrelet and other sea birds, if the project would result in the increase of fishing by gillnets.

17. The gill net fishery does not occur where marbled murrelets are common in the Neah Bay area, see EA-8.7.f.1. The gill net fishery will not increase following construction of the marina, since the total take is restricted, and thus the Corps and the Tribe are not planning to fund an observer program.

18. The removal of sand from the beaches, both within and to the east of the east breakwater, should be prohibited because of the limited recruitment of beach material and the impact of removal on the proposed mitigation.

18. The Corps concurs that the removal of sand from the beach within the marina and east of the breakwater should be restricted.

APPENDIX B - PART 4

COMMENTS AND RESPONSES

APPENDIX B, PART 4

COMMENTS AND RESPONSES ON THE
DRAFT DETAILED PROJECT REPORT AND
DRAFT ENVIRONMENTAL ASSESSMENT

The draft edition of this report was distributed for public and agency review on 1993, under the title "Draft Detailed Project Report and Draft Environmental Assessment, Neah Bay Navigation Improvement Study, Neah Bay, Washington, July 1993." Comments were requested by 1993. The following letters were received as a result of the public review and are reproduced here with the Corps of Engineers responses.

TABLE OF CONTENTS

APPENDIX C

ECONOMIC ANALYSIS AND COST SHARING

APPENDIX C

ECONOMIC ANALYSIS AND COST SHARING

TABLE OF CONTENTS

SECTION 1 - SOCIOECONOMIC ENVIRONMENT

SECTION 2 - ECONOMIC EVALUATION

TABLES

APPENDIX C

NEAH BAY COMMERCIAL MARINA

ECONOMIC ANALYSIS AND COST SHARING

SECTION 1. SOCIOECONOMIC ENVIRONMENT

1.01 Purpose and Scope. Purpose of this study was to identify and describe the socioeconomic study area as well as evaluate economic benefits and determine the economic feasibility of the proposed project. In addition, this study determined the estimated Federal and non-Federal share of project construction, operation and maintenance costs.

1.02 Economic Study Area. The Makah Indian Reservation was selected as the study area since most of the economic and social impact of the project will be on the reservation. Where reservation data was not available, county data was used.

1.03 Project Location and Description. The proposed Neah Bay commercial marina is on the Makah Indian Reservation at Neah Bay, Washington, in Clallam County, in the state of Washington. The Makah Indian Reservation is located in an isolated part of the state, approximately 140 miles northwest of Seattle, 70 miles west of the closest major community center of Port Angeles, Washington and 6 miles east of Cape Flattery on the southern shore at the entrance to the Strait of Juan de Fuca. The only road access to Neah Bay is via a two-lane state highway. The reservation is bordered on the north by the Strait and on the west by the Pacific Ocean and consists of 27,950 acres including the entire shoreline of Neah Bay. The Ozette Reservation is part of the Makah Reservation and is located 10 miles to the south of Neah Bay on the Pacific Ocean. The proposed marina is located in prime fishing grounds as all salmon entering Puget Sound must pass Neah Bay. In addition, some of the best commercial marine and shellfish fishing in the state is located in the project area. The marina will be owned and operated by the Makah Indian Tribe.

1.04 Natural Resources. Five major watersheds drain the 140 square miles of Reservation land. The rivers located in these watersheds are the Sekiu, Sail, Waatch, Hoko and Sooes Rivers. The valleys of the Waatch and Sooes Rivers contain the only level land within the Reservation and are used for livestock grazing. Waters bordering the west and north side of the reservation contain strong fishery resources. Five species of salmon pass near the reservation on their way to fresh water streams along the Straits

and Puget Sound. Marine and shellfish abound in the highly productive waters around Neah Bay. These fisheries attract large numbers of commercial and recreational fishermen.

1.05 Land Use. The total land area of the reservation is forty square miles. The bulk of the Reservation land is rugged mountains with elevations typically between 500 and 1,000 feet. Over 1,000 acres of Reservation land bordering the Pacific Ocean has been set aside as a Wilderness Area. Of the 27,950 acres that comprise the Reservation, 25,596 acres are timbered and intensively managed for the production of forest products.

1.06 Human Resources. In 1980, the population of Clallam County was 51,648. By 1990, the population had grown to 56,464 - an average annual increase of 0.9 percent. Over the same time period, the American Indian population in Clallam County grew from 2,067 to 2,695 - an average annual increase of 2.69 percent. 1/

The population of the Makah Reservation consists of Indian and non-Indian residents. As shown in table 1-1, the 1980 population of the Reservation was 1,245 and consisted of 803 Indians and 442 non-Indians. 1/ By 1992, the population of the Reservation was 1,700 of which 1,379 were Indian and 321 were non-Indian. 2/ The median age of the Makah Tribe has increased from 19.7 years in 1980 to 24.3 years in 1990.

1/ 1980 and 1990 Census of Population for the state of Washington, U.S. Department of Commerce, Bureau of Census.

2/ "A Profile of the Makah Tribe", January, 1992.

TABLE 1-1

INDIAN AND NON-INDIAN POPULATION OF MAKAH INDIAN RESERVATION

Year	Indian	Non-Indian	Total
1980	803	442	1,245
1992	1,379	321	1,700
Average Annual Percent Change	+4.61	-2.63	+2.63

1.07 Government. The Makah Indian Reservation is governed by a 5-member tribal Council. The tribal Council is responsible for providing and overseeing such services to the community as education, housing, health, law enforcement, utilities, natural resource planning and management, economic planning, public safety and recreation.

SECTION 2. ECONOMIC EVALUATION

2.01 General. The proposed Neah Bay Marina is comprised of 200 commercial slips. Commercial navigation benefits produced by this new project consist of increased net income to commercial fishermen resulting from transportation cost savings, reduced damages to vessels and facilities, reduced launching costs and the value of time saved.

2.02 Without Project Condition. The without-project condition is the most likely condition expected to exist over the life of the project in the absence of the proposed project. This without project condition was assumed to reflect existing conditions over the life of the project. Without project conditions specific to each benefit category are discussed in the benefit portion of this report in section 2.06.

2.03 With Project Condition. The with-project condition is the condition expected to exist with the project. Construction of the Neah Bay Marina will consist of (1) constructing floats, finger piers and related facilities sufficient to accommodate 200 commercial vessels. (2) 1800 feet of breakwater to provide wave protection to vessels, (3) dredging 50,000 cubic yards of sand to provide adequate depth for vessels navigating and mooring inside the marina, and (4) sufficient parking and utilities to accommodate commercial users of the marina. The proposed project will decrease the operating costs of commercial fishermen using this facility thereby increasing their net income and will also increase their leisure time. Other with project conditions specific to each benefit category can be found in section 2.06

2.04 Historical Fleet and Fishery Data. Presented below in sub-paragraphs a through c are historical data pertaining to the Washington State commercial fishing fleet, plus salmon, marine and shellfish landings. Paragraphs d through l show historical information on the Neah Bay commercial fishing fleet and salmon, marine, and shellfish landings.

a. **Washington State Fishing Fleet Profile.** Shown in table 2-1 is a profile of the commercial fleet which fish Washington's waters. The profile shows the number of fishing vessels in the fleet as of 1987 (latest available year) and the capitalized value of each type of vessel. Data on Urchin vessels, which are a new vessel type in the state of Washington within the last 2-3 years, was not available.

TABLE 2-1

PROFILE OF WASHINGTON'S LOCAL COMMERCIAL FISHING FLEET IN 1987 1/

	Number of Vessels 2/	Capitalized Value (millions of $)
Salmon Gillnet	1,695	30.5
Salmon Troller	956	14.3
Purse Seine	325	21.1
Crab Pot	295	16.2
Longline	6	15.9
Groundfish Trawl	99	14.9
Shrimp Trawl	49	9.8
Total	3,525	122.7

1/ Source: Commercial Fishing and the State of Washington, 1988, Natural Resource Consultants

2/ Estimated based on data from Department of Fisheries which includes indian and non-indian owned vessels but excludes skiffs.

b. Washington State Landings of Salmon. Table 2-2 shows the commercial landings of salmon, by species, in Washington State between 1980 and 1991. Over this 11 year period, commercially caught salmon has ranged from a low of 26,311,000 pounds in 1983 to a high of 65,885,000 pounds in 1985.

TABLE 2-2

COMMERCIAL LANDINGS OF SALMON IN WASHINGTON STATE 1980 - 1991 BY SPECIES (thousand of pounds)

Year	Chinook	Chum	Pink	Coho	Sockeye	Total
1980	7,956	10,540	11	12,926	3,010	34,443
1981	6,363	6,038	19,909	7,210	7,538	47,058
1982	7,062	12,072	1	11,930	18,447	49,512
1983	3,940	5,966	8,411	5,719	2,275	26,311
1984	4,257	7,978	0	5,830	9,719	27,784
1985	5,616	11,888	22,062	9,890	16,429	65,885
1986	6,367	13,296	1	12,647	17,348	49,659
1987	8,294	13,906	9,611	12,722	11,931	56,464
1988	9,313	18,458	1	8,662	5,313	41,747
1989	8,316	9,785	15,183	8,492	12,279	54,055
1990	6,641	11,961	2	8,780	12,397	39,781

c. Washington State Landing of Marine and Shellfish. Marine fish consist of bottomfish, baitfish, albacore tuna and halibut. Shellfish are comprised primarily of crab, shrimp, urchin, clams and oyster. The 1980-1991 commercial landings of marine and shellfish in Washington State are presented in table 2-3. As shown, marine fish landings ranged from a low of 85,580,000 pounds in 1990 to a high of 125,572,000 pounds in 1984. Since 1984, total landings of marine fish have been declining. Due to concerns about over fishing these resources, a limited entry fishery covering the entire west coast is scheduled to be implemented in 1994. If implemented, a maximum number of vessels permitted to fish for bottomfish, by area, will be established. Shellfish landings have ranged from a low of 23,072,000 pounds in 1982 to a high of 68,254,000 pounds in 1988.

TABLE 2-3

COMMERCIAL LANDINGS OF MARINE AND SHELLFISH IN WASHINGTON STATE (1980-1991) 1/ (in thousands of pounds)

Year	Marine Fish	Shellfish	Total
1980	99,022	32,948	131,970
1981	99,683	27,685	127,368
1982	109,180	23,072	132,252
1983	111,504	26,007	137,511
1984	125,572	24,360	149,932
1985	108,499	29,686	138,185
1986	101,975	43,481	145,456
1987	113,311	47,954	161,265
1988	92,771	68,254	161,025
1989	94,443	64,297	158,740
1990	85,580	49,073	134,653

1/ "Fisheries Statistical Report" Washington State Department of Fisheries.

d. Neah Bay Fishing Fleet. There are six primary types of commercial fishing vessels which work the Neah Bay fishing areas. These vessels are used to catch salmon, marine or shellfish and consist of trawlers, longliners, set neters, gillnetters, trollers and crabbers and shrimpers. Following is a description of each type of vessel.

(1) Trawlers - These boats typically range from 50 to 300 feet in length. The boats are named for their nets which are sock-shaped and towed from astern at three to four knots through schools of bottom fish usually at depths of 40 to 50 fathoms. Floats attached to the top of the net and weights attached to the bottom serve to open the net vertically. Trawlers fish year around and generally fish off the coast.

(2) Longliners - These vessels range in length from 50 to 80 feet. These fishermen use lines as long as 2000 feet to which baited hooks are attached on short, separate lines called ganglions. The lines are weighted down with an anchor. These fishermen fish primarily for halibut and cod.

(3) Set Neters - Indian fishermen use set gillnets to fish for salmon. These nets are placed in the water and are anchored at each end. These nets are usually used near shore with one end attached to shore and the other end to a buoy.

(4) Gillnetters - These boats usually range in length from 25 to 40 feet and are used to catch salmon. Commercial fishermen can use nets up to 2100 feet in length that hang in the water to a depth up to 100 feet like an upright fence of netting. Fish swim into the net but can not back out because their gills act like barbs. The net is suspended in the water by corks or floats. The bottom of the net is weighted by a lead line anchor to keep it vertical in the water.

(5) Trollers - These boats use poles, lines and lures to troll for salmon and bottomfish. Boats range from 20 to 50 feet in length. A typical modern troller has two poles set amidship and two shorter bow poles. The poles are kept upright when traveling and are lowered to a 45 degree angle when fishing. Two lines are usually fished from each of the main poles and one line from each of the bow poles. As many as five or more lures may be attached to one line by snap-ons and strong nylon leaders. Typical fishing speed is two to three knots.

(6) Crabbers, Shrimpers and Urchin - Crab and shrimp vessels range in length from 40 to 120 feet. Crab and shrimp pots are very similar to those recreational boaters use - just larger and heavier. A typical pot used for harvesting Dungeness crab has a circular steel frame of 3 to 3 1/2 feet in diameter, is covered with stainless steel wire mesh and weighs 60-120 pounds. Pots can be fished as single units with a separate buoy line or as multiple units attached to a common groundline with an anchor, buoy and flagpole at each end of the string. Sea Urchins are harvested by divers who operate from moveable motorized platforms or urchin vessels. These platform provide a flat and relatively stable work station for urchin divers and their helpers.

e. Neah Bay Landings of Salmon, Marine and Shellfish. The Neah Bay fishing area for salmon encompasses the area from about Sekiu on the Strait, west to Cape Flattery and then south in the Pacific Ocean to the Queets River. The fishing area for marine and shellfish extends from just west of Sekiu on the Strait, west to around Capt Flattery and then south in the Pacific Ocean to about Cape Elizabeth.

The Neah Bay fishing areas yield salmon, marine and shellfish to commercial fishermen. Presented in table 2-4 are pounds of fish, by species, caught in the Neah Bay area in years 1989, 1990 and 1991 (latest available data). During this time period, salmon landings have averaged almost 3 million pounds while marine and shellfish landings have averaged almost 24 million pounds.

TABLE 2-4

NEAH BAY FISHING AREA-SALMON AND MARINE/SHELLFISH COMMERCIAL CATCH FOR 1989,1990 AND 1991 IN POUNDS

Species	Year and Pounds		
Salmon	1989	1990	1991
Chinook	636,882	767,479	573,980
Chum	525,222	500,603	448,172
Coho	957,137	1,132,672	749,599
Pink	427,600	582	326,307
Sockeye	461,299	717,145	541,672
Total Salmon	3,008,140	3,118,481	2,639,730
Steelhead	3,744	3,116	908
Marine/Shellfish			
Cod	3,328,556	3,054,368	3,289,747
Flounder	4,278,497	6,735,055	4,451,217
Perch	445,381	451,980	489,294
Rockfish	5,908,593	6,915,520	5,007,949
Sablefish	3,132,017	2,475,944	2,935,423
Shellfish	1,561,350	587,543	1,933,846
Sole	2,499,311	2,256,074	1,967,107
Urchin	-	808,289	1,579,662
Other	1,102,426	1,435,098	2,260,128
Total Marine fish/ Shellfish	22,256,131	24,719,871	23,914,373
Total Catch	25,268,015	27,841,468	26,555,011

f. Landed Pounds of Salmon, Marine and Shellfish by Gear Type. Shown in table 2-5 are the total landed pounds of salmon, marine and shellfish caught in the Neah Bay fishing areas by type of gear in 1989, 1990 and 1991. Trawlers and longline fishermen catch about 80 percent of the total landed fishery. Table 2-6 delineates in more detail the percent of commercial catch by gear type over the same time frame.

TABLE 2-5

TOTAL POUNDS OF NEAH BAY COMMERCIAL CATCH BY GEAR TYPE

Gear Type	Year and Pounds		
	1989	1990	1991
Trawler	16,398,377	19,439,775	17,493,565
Longline	3,997,976	2,663,581	3,725,689
Troller	1,679,846	1,949,428	1,465,323
Gillnet	1,655,870	1,439,769	1,332,679
Dip Bag Net 1/	15,463	820,139	1,579,662
Shellfish Pot 2/	929,603	256,186	472,708
Handline Jig	556,505	1,200,551	422,933
Other	34,375	72,039	62,452
Total Pounds	25,268,015	27,841,468	26,555,011

1/ Includes Sea Urchin catch beginning in 1990.

2/ Crab and shrimp.

TABLE 2-6

PERCENT OF COMMERCIAL CATCH BY GEAR TYPE

Gear Type	Year		
	1989	1990	1991
Trawler	64.9	69.8	65.9
Longline	15.9	9.7	14.0
Troller	6.6	7.0	5.6
Gillnet	6.6	5.2	5.0
Dip Bag Net	-	2.9	5.9
Shellfish Pot	3.7	.9	1.8
Handline Jig	2.2	4.3	1.6
Other	.1	.3	.2
Total	100.0	100.0	100.0

g. Indian and Non-Indian Share of Salmon Catch. As shown below in table 2-7, Indians have caught most of the commercially caught salmon in the Neah Bay fishing areas. Their share of the catch has ranged from 89 percent in 1989 to 78 percent in 1991.

TABLE 2-7

NEAH BAY INDIAN AND NON-INDIAN COMMERCIAL SALMON CATCH

Year	Pounds of Salmon		Percentage Caught By:	
	Indian	Non-Indian	Indian	Non-Indian
1989	2,673,363	334,777	89%	11%
1990	2,508,519	609,962	80	20
1991	2,057,817	581,913	78	22

h. Indian Caught Salmon By Gear Type. Over the 1989-91 time period, Indian gillnetters have caught about 60 percent of the Indian landed salmon. Indian salmon trollers have landed most of the remaining 40 percent. Table 2-8 shows the amount of salmon caught by Indians by gear type.

TABLE 2-8

POUNDS OF INDIAN CAUGHT SALMON BY GEAR TYPE

Gear Type	Year		
	1989	1990	1991
Troller	995,572	1,069,033	776,331
Gillnet	1,649,033	1,427,119	1,270,761
Other	28,758	12,387	10,725
Total	2,673,363	2,508,519	2,057,817

i. Non-Indian Caught Salmon By Gear Type. Of the salmon caught by non-Indian fishermen in the Neah Bay area, about 95 percent were caught by salmon trollers and 5 percent by gillnetters. Table 2-9 shows the amount of non-Indian caught salmon by type of gear.

TABLE 2-9

POUNDS OF NON-INDIAN CAUGHT SALMON BY GEAR TYPE

Gear Type	Year		
	1989	1990	1991
Troller	334,309	600,302	522,094
Gillnet	468	9,660	59,819
Total	334,777	609,962	581,913

j. Marine and Shellfish Catch. As shown in table 2-10, non-Indian commercial fishermen have concentrated their efforts on landing marine and shellfish. Between 1989 and 1991 non-Indian fishermen have caught between 96 and 99 percent of the marine and shellfish in the Neah Bay fishing area.

TABLE 2-10

INDIAN AND NON-INDIAN COMMERCIAL MARINE/ SHELLFISH CATCH BY YEAR

Year	Pounds of Marine/Shellfish		Percentage	
	Indian	Non-Indian	Indian	Non-Indian
1989	662,878	21,593,253	3%	97%
1990	317,926	24,401,945	1%	99%
1991	1,020,281	22,894,092	4%	96%

k. Indian Caught Marine/Shellfish. Of the total pounds of Indian landed marine and shellfish, 75 percent was caught by longliners between 1989 and 1991. The next largest amount or 13 percent was caught using crab and shrimp pots. Shown in table 2-11 are the types of gear used by Indian fishermen and the pounds of marine and shellfish caught by each gear type in the Neah Bay fishing areas between 1989 and 1991.

TABLE 2-11

POUNDS OF INDIAN CAUGHT MARINE/ SHELLFISH BY GEAR TYPE

Gear Type	Year		
	1989	1990	1991
Troller	34,050	23,674	53,575
Longline	460,432	163,703	868,372
Set Net	5,214	39,011	4,552
Gillnet	3,074	145	1,315
Hand Line Jig	1,384	3,266	1,109
Shellfish Pot	155,355	67,922	44,293
Trawler	0	20,405	0
Dip Bag Net	3,369	0	47,065
Total	662,878	317,926	1,020,281

1. **Non-Indian Caught Marine and Shellfish By Gear Type.** As shown in table 2-12, non-Indian trawler caught 77 percent of the marine and shellfish landed in the Neah Bay fishing area between 1989 and 1991. Longliners caught the next largest share over this time period, or 13 percent. Table 2-12 shows the types of gear used by non-Indians to catch marine and shellfish in the Neah Bay fishing area as well as pounds of product by gear type.

TABLE 2-12

POUNDS OF NON-INDIAN CAUGHT MARINE/ SHELLFISH BY GEAR TYPE

Gear Type	Year and Pounds		
	1989	1990	1991
Troller	315,869	256,404	113,309
Longline	3,537,544	2,500,078	2,857,317
Hand Line Jig	555,121	1,197,285	421,824
Shellfish Pot	774,248	188,264	428,415
Trawler	16,398,377	19,439,775	17,493,565
Dip Bag Net	12,094	820,139 1/	1,579,662
Total	21,593,253	24,401,945	22,894,092

1/ Start of Urchin fishery.

2.05 Future Fishing Conditions. The State of Washington is currently planning on implementing a coastal limited entry fishery for marine fish beginning in 1994. The boundaries of this fishery will include the Neah Bay fishing areas including Cape Flattery eastward to the Sekiu River. The limited entry will apply to only non-Indian commercial fishermen. The number of non-Indian commercial fishermen allowed to fish coastal waters will be determined based on the vessels that were fishing for marine fish between 1984 and 1988. In addition to restricting the number of non-Indian commercial fishermen, there will also be a quota on the pounds of fish caught by species. If a certain species is being fished beyond its sustainable yield, fishing of that species will be curtailed as necessary.

Non-Indian fishermen who do not qualify for a limited entry permit will be allowed to fish an open access fishery. These fishermen will be allowed to harvest the same areas and fish as limited entry fishermen but they will have a different quota.

Indian fishermen are not directly governed by the limited entry however, if a given species is being over fished the state can implement quotas until that species regains its sustainable yield.

According to the Washington State Department of Fisheries, the pounds of marine fish caught in the Neah Bay area between 1989 and 1991 did not exceed the sustainable yield for that area. However, due to without project uncertainties about whether the future Neah Bay fishing fleet will catch their quota of bottom fish on a regular basis, benefits to fishermen based on being able to increase their catch of marine fish as a result of the project, thereby increasing their net income, were not claimed.

2.06 Demand For Moorage. In this analysis, the project was formulated to accommodate only the benefitting vessels of the current fleet fishing in the Neah Bay fishing grounds. This approach reflects the scheduled implementation of limited entry and fish quotas on commercial fishing on the West Coast as discussed in the above paragraph. Limited entry and fish quotas will restrict the number of vessels fishing in the Neah Bay fishing grounds to basically the existing fleet. A fleet larger than what is currently fishing in this area would have an adverse impact on this area's sustainable yield.

In a typical commercial marina analysis, due to the large amount of fixed costs associated with constructing a marina (i.e. breakwater and entrance and turning basin dredging) the larger the number of benefitting vessels the greater the net benefits, at least to a point. For this project the marina was sized to accommodate the existing commercial fleet of benefitting vessels which total 200. That is because, (1) based on limited entry and fish quotas, the existing commercial fleet is not expected to increase in the future and (2) due to the cost of the breakwater and dredging as well as

the nature of benefits claimed, a marina which would accommodate fewer than 200 commercial vessels would have lower net benefits than the recommended project. The proposed marina is expected to be full starting in project year one.

2.07 Commercial Fishing Benefits. Cost saving benefits in this study accrue primarily to the Indian and non-Indian winter marine and salmon fisheries. Some benefits also accrue to the Indian and non-Indian spring salmon fishery. The following subsections cover the major benefits categories resulting from constructing the proposed project. Benefit categories are: (a) savings in vessel operating costs traveling from port to fishing grounds, (b) savings in vessel operating costs traveling from fishing grounds to fish processor, (c) savings in vessel damages, (d) savings in dock damages, (e) reduced launching costs and (f) value of time saved. Dollar savings have been rounded to the nearest $1,000.

a. Vessel Operating Cost Savings Traveling From Port to Fishing Grounds. Variables used to quantify vessel operating cost savings consist of: (1) number of vessels per vessel type accruing operating cost savings, (2) number of trips per year per vessel type, (3) miles saved per year per vessel type, and (4) vessel operating cost per mile per vessel type.
The winter commercial fishing fleet operating in the Neah Bay area which will accrue this project benefit consists of Indian trollers and longline vessels as well as non-Indian trawlers, trollers, longline and Sea Urchin vessels. During the winter months, these commercial fishermen operate out of protected marinas at Sekiu and Port Angeles and must navigate from these marinas to the Neah Bay fishing grounds during the fishing season. With a protected marina at Neah Bay these vessels would no longer have to navigate the extra miles from Sekiu and Port Angeles to fish. These fishermen would accrue a savings in operating costs as a result of the reduced number of miles required to navigate between Neah Bay and the fishing grounds compared to their without project operations.

The winter Sea Urchin fishery rotates between harvesting Urchins at (1) Port Angeles, (2) west of Sekiu and (3) near Neah Bay. When the harvest is west of Sekiu or Port Angeles, vessels operate out of marinas at these locations. However, when the fishery is at Neah Bay (every 3rd year) vessels must travel from Sekiu and Port Angeles to harvest Sea Urchins. Under with project conditions, when the harvest is at Neah Bay, harvesters will only have to navigate from Neah Bay to the Sea Urchin grounds, rather than from Sekiu or Port Angeles. This will result in a vessel operating cost savings which will occur every 3rd year over the project life.

These benefits have been discounted at 8.25 percent assuming the first with project Neah Bay fishery begins in project year 2 and happens every 3rd year thereafter over the life of the project.

The number of Indian and non-Indian vessels by vessel type and

round trips per year from their without project origin which accrue vessel operating cost savings are shown in table 2-13. The number of fishing trips are based on historical data which is expected to continue into the future.

TABLE 2-13

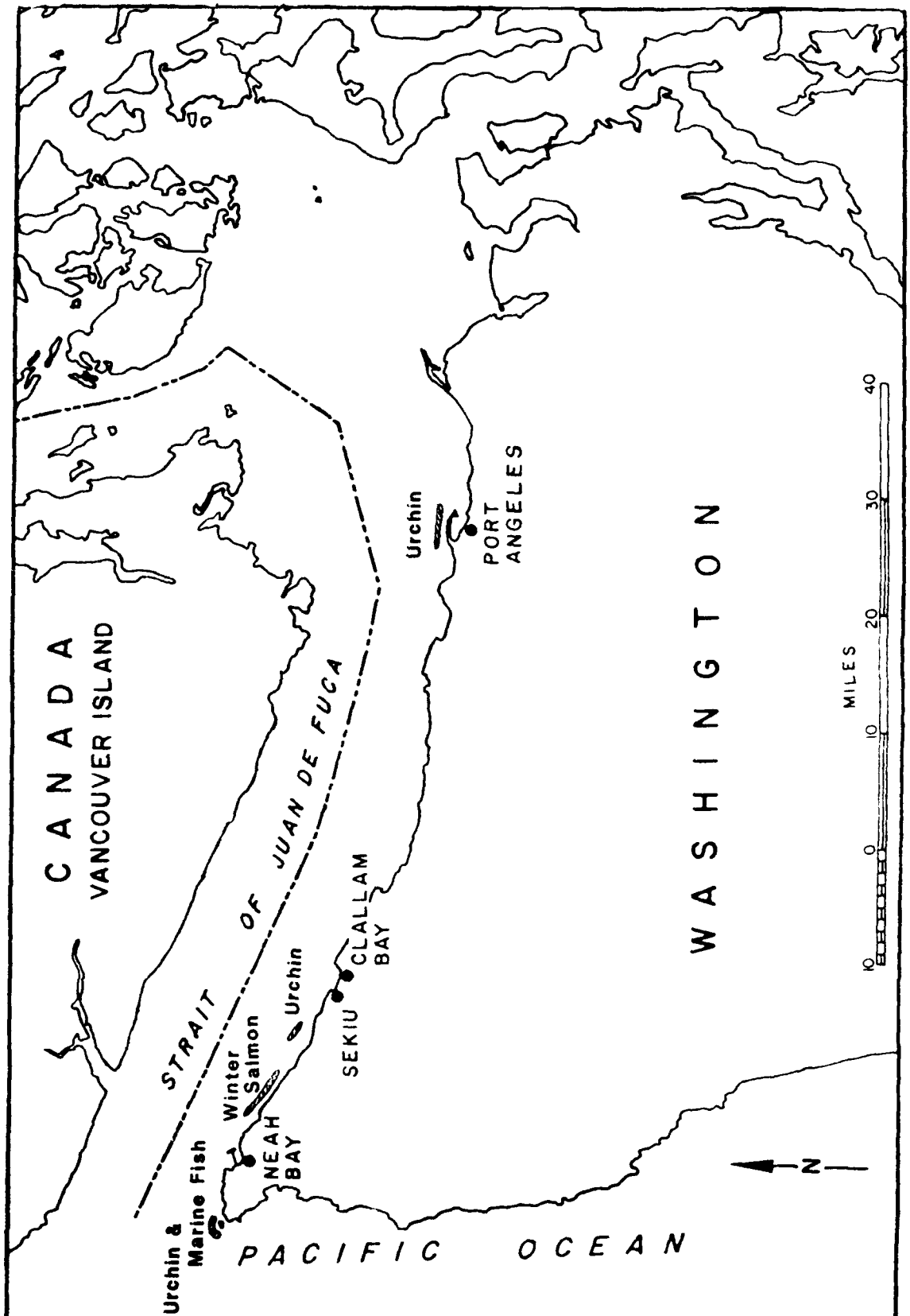
VESSELS AND VESSEL TRIPS ACCRUING OPERATING COST SAVINGS TO AND FROM FISHING GROUNDS

Vessel Type	Sekiu		Port Angeles	
	Vessels	Trips	Vessels	Trips
Indian Fleet				
Troller	6	10	15	10
Longline	-	-	2	10
Non-Indian Fleet				
Trawler	-	-	21	12
Troller	4	2	5	2
Longline	-		36	12
Urchin	23	15	23	15

The incremental nautical miles saved per round trip per vessel type represents the difference between the without project miles traveled per vessel minus the with project miles traveled. Shown in table 2-14, is the without project travel route, the without project round trip miles incurred, the with project round trip miles incurred based on vessels using the proposed project and the incremental mileage savings per vessel round trip for the Indian and non-Indian fleet. The information shown in table 2-14 is based on the following nautical mile round trip distances:

Port Angeles to Neah Bay	126 Miles
Port Angels to Seiku	90 Miles
Neah Bay to Ocean (Tatoosh Island Area)	16 Miles
Seiku to Neah Bay	36 Miles
Neah Bay to Winter Salmon fishing on Straits	12 Miles
Seiku to Winter Salmon fishing on Straits	24 Miles

Figure C-1 delineates the Neah Bay fishing grounds for marine fish, urchin and salmon.



NEAH BAY AREA COMMERCIAL FISHING GROUNDS FIGURE C-1

TABLE 2-14

INCREMENTAL ROUND TRIP MILEAGE SAVINGS BY FLEET AND VESSEL TYPE

	Without Project Route	Without Project R/T Miles	With Project R/T Miles	Incremental Round Trip Mileage Savings
Indian Fleet				
* Troller	Port Angeles to winter salmon fishing grounds in Straits between Neah Bay and Sekiu.	112	12	100 Miles
* Troller	Sekiu to winter salmon fishing grounds on Straits between Neah Bay and Sekiu.	24	12	12 Miles
* Longline	Port Angeles to ocean (Tatoosh Island area) for winter marine fish.	142	16	126 Miles
Non-Indian Fleet				
* Trawler, Longline, Troller & Urchin	Port Angeles to ocean for winter marine fish and Urchin harvest.	142	16	126 Miles
* Troller & Urchin	Sekiu to ocean for winter marine fish and Urchin.	52	16	36 Miles

* Trawler, Longline, & Troller - Ocean to Bellingham during storm to offload fish.	241	16	225 Miles
* Urchin - West of Sekiu to Port Angeles during storm to offload harvest at a protected marina.	95	25	70 Miles
* Urchin - Ocean to Port Angeles dur ng storm to offload harvest at a protected marina.	142	16	126 Miles

Table 2-15 shows the computation of total miles saved per year by fleet and vessel type as a result of the shorter trip distance between the with and without project condition when traveling to and from the fishing grounds. This is a function of the number of benefitting vessels times the number of benefitting trips times the miles saved per trip. The number of benefitting vessels and trips was based on discussions with commercial fishermen currently fishing in the Neah Bay area as well as commercial fishermen who have indicated a desire to have protected winter moorage at Neah Bay.

TABLE 2-15

TOTAL MILES SAVED PER YEAR TRAVELING TO AND FROM FISHING GROUNDS INDIAN AND NON-INDIAN FLEET

Vessel Type	Number of Vessels	Number of Trips	Incremental Miles Saved Per Trip	Total Round Trip Miles Saved
Indian Fleet				
Troller				
Port Angeles	15	10	100	15,000
Sekiu	6	10	12	720
Longline				
Port Angeles	2	10	126	2,520
Non-Indian Fleet				
Trawler				
Port Angeles	21	12	126	31,752
Longline				
Port Angles	36	12	126	54,432
Troller				
Port Angles	5	2	126	1,260
Sekiu	4	2	36	288
Sea Urchin				
Port Angeles	23	15	36	12,420
Sekiu	23	15	126	43,470

Variable operating costs of commercial fishing vessels are comprised primarily of fuel, maintenance, and engine repair costs. These costs total $4.32 per mile for trawlers, $2.97 per mile for trollers, $2.34 per mile for longline vessels, and $1.00 per mile for urchin vessels. Computation of these costs is shown in table 2-16.

TABLE 2-16

VESSEL OPERATING COSTS 1/

Vessel Type	Vessel Speed 2/ (knots)	Fuel Consumption Gal./ Hour 2/	Gal./ Mile	Fuel Cost Per Mile 3/	Maint. Cost Per Mile 4/	Total Operating Cost Per Mile
Trawler	10	24	2.4	$2.40	$1.92	$4.32
Longline	10	16.5	1.65	1.65	1.32	2.97
Troller	8	11	1.38	1.38	1.10	2.48
Urchin	25	12	.50	.50	.50	1.00

1/ Costs for trawler and longline vessels represents an average of several vessel sizes.

2/ Source: Ed Monk Jr., Naval Architect

3/ Diesel Fuel @ $1.00 per gallon. Cost is based on information provided by commercial fishermen and marina operators.

4/ Based on current operating and maintenance costs taken from a sample fishing fleet. Maintenance costs of fishing vessels, except urchin, are on average about 80 percent of fuel costs. Maintenance costs of urchin vessels are 100 percent of fuel costs.

Computation of vessel operating cost savings benefits as a result of being located closer to the fishing grounds is shown in table 2-17.

TABLE 2-17

VESSEL OPERATING COST SAVINGS
MOORAGE AREA TO FISHING GROUNDS

Vessel Type	Round Trip Miles Saved Per Year	Operating Cost Per Mile	Operating Cost Savings
Trawler	31,752	$4.32	$137,000
Longline	56,952	2.97	169,000
Troller	17,268	2.48	43,000
Urchin	55,890	1.00	18,000 1/
Total Operating Cost Savings			$367,000

1/ Benefits accrue every 3rd year over the project life and were assumed to begin in project year two and have been discounted and levelized over the project life at 8.25 percent.

b. Vessel Operating Cost Savings Traveling From Fishing Grounds to Fish Processor. There is currently a marine fish processor at Neah Bay. Many commercial fishermen like to sell their catch to this local processor so they can avoid running their vessels to processors located a much greater distance from the Neah Bay fishing grounds. There are times during the winter fishing season when the water conditions at Neah Bay are so rough they force these fishermen to travel to processors located at protected marinas. Alternative marine fish processors used by Neah Bay fishermen in these situations are located primarily at Bellingham and Seattle. Urchin fishermen typically run to Port Angeles. Under with project conditions, the Neah Bay fish processor's dock will be protected from winter storms and rough water conditions so that during stormy weather fishermen will be able and are expected to sell and offload their catch at Neah Bay rather than being forced to travel to processors located farther away. This will result in vessel operating cost savings. This benefit was quantified by determining the benefitting vessel types, number of benefitting vessels, number of trips saved per year, round trip miles saved and vessel cost per mile. The number of benefitting vessels and annual trips saved were based on discussions with Neah Bay commercial fishermen and the local fish processor. See table 2-18 for computation of this benefit.

TABLE 2-18

OPERATING COST SAVINGS
FISHING GROUNDS TO FISH PROCESSOR

Vessel Type	Number of Vessels	Trips per Year	Round Trip Miles	Total Miles Saved	Cost Saved Per Mile	Total Savings
Trawler	9	4	225	8,100	$4.32	$35,000
Longline	47	4	225	42,300	2.97	126,000
Urchin	46	5	126	29,000	1.00	10,000 1/
Urchin	46	5	70	16,100	1.00	5,000 2/
Total Benefit						$176,000

1/ Savings are based on round trip miles from Neah Bay to Port Angeles. Savings have been discounted at 8.25 percent assuming savings begin in project year 2 and occur every 3rd year thereafter.

2/ Savings are based on round trip miles from west of Sekiu to Port Angeles. Saving have been discounted at 8.25 percent assuming savings begin in project year 3 and occur every 3rd year thereafter.

c. Reduction in Vessel Damages. Existing conditions include a 8,000 foot breakwater which extends from the northwesterly shore of Neah Bay to Waadah Island and was developed to provide a harbor of refuge. Even with this breakwater, wind generated waves out of the north through east cause wave action within the bay sufficient to damage vessels and facilities. As a result, there have been numerous fishing vessels at Neah Bay which have incurred damages from winter and spring storms. Over the 1983-1992 time period, there have been 44 fishing vessels which have reported damage or have sunk as a result of storm generated waves at Neah Bay. Damages to these vessels from these storms total $530,000 or an average of $53,000 per year. Under without project conditions, vessel damage is expected to continue to occur. Construction of the proposed project breakwater will provide wave protection to fishing vessels so that future storm damage to fishing vessels moored at Neah Bay will be eliminated. Based on historical vessel damages at Neah Bay over the last 10 years, storm damage reduction benefits are estimated at $53,000 per year.

d. Reduction in Dock Damages. During the winter of 1988-89, a loading dock for a fish processing facility at Neah Bay incurred damage from a severe storm which cost $360,000 to repair and improve. If the proposed project breakwater had been in place this damage would not have occurred. Future without project damage to

this dock, based on the frequency of severe storms at Neah Bay, was assumed to occur once every 10 years causing damages totaling $150,000. Benefits were based on the elimination of future damages to the dock from severe storms with the first severe storm assumed to occur in project year five followed by a severe storm every 10 years. Benefits were discounted and levelized over the 50-year project life at 8.25 percent and total $15,000 per year.

e. Saving in Vessel Launching Costs. During the winter and spring months most of the Indian troller vessels under 25 feet and some over 25 feet are usually taken out of the water after each fishing trip in order to protect them from damage. These vessels are kept on trailers until the next fishing trip. The cost to launch and retrieve a vessel is $80. Under with project conditions, these vessels would be kept in the water during the winter thereby eliminating the need and cost to launch and retrieve these vessels. Project benefits were quantified by multiplying the number of vessels launched from trailers in the winter by the number of launchings eliminated as a result of the project times the cost per launch and retrieve. Savings in vessel launching cost benefits total $35,000 per year. Quantified benefits are shown in table 2-19.

TABLE 2-19

SAVINGS IN VESSEL LAUNCHING COSTS

Vessel Type	Number of Vessels on Trailers	Number of Launchings Per Winter and Spring	Cost Per Launching	Total Benefit
Troller < 25'	35	8-10	$80.00	$25,000
Troller >25'	11	8-10	80.00	8,000
Enforcement Vessel	1	18-20	80.00	2,000
Total Benefit				$35,000

f. Value of Time Saved. The value of time saved as a result of a project is measured by the willingness to pay of the boat owner and hired labor for the reduction in travel time. In accordance with current regulations, the following assumptions were made in this analysis.

* For both the with and without project conditions, harvest quotas are assumed to be in place and no increases in net revenue to the industry are possible from increased harvest.

* For both the with and without project conditions, the total number of crew on the vessels will be the same. However, the hours the workers are on the boat will be reduced by the project. Savings in cost will be the result of the reduced hours on the boat having a value in an alternative use.

* Time saved by the project will be a small portion of the trip time for the season and saved time will be realized in blocks of time too small to permit alternative employment having a wage equal to the crew wage. Therefore, the alternative wage rate used in this analysis was equal to the value of leisure time or 1/3 the average per-hour wage rate for commercial fishermen fishing for marine fish.

Data sources contacted to obtain data necessary to impute the hourly wage rate of commercial ground fish fishermen consisted of:

* University of Washington Sea Grant
* Oregon State University Sea Grant
* Pacific Fisheries Management Council
* National Marine Fisheries Service
* Natural Resource Consultants

Raw data was extremely difficult to obtain simply because there is not much current data available for the West Coast (Washington, Oregon and California) marine fishery. What current data was available and used to quantify the hourly wage rate was published in a document entitled "Amendment 6 (Limited Entry) To The Fisheries Management Plan For Pacific Coast Groundfish", Fisheries Management Council, dated January, 1992, pp. 5-39, 5-40 and 7-18. This document presents revenue information as it relates to the trawl fishery.

Commercial fishermen in the state of Washington are typically paid on a per share basis plus they are also provided their meals during the fishing trip. The value per share is the sum of the fisherman's direct share payment plus the value of food provided when they are on the vessel. Based on data in the referenced publication, the average share value of a trawl vessel captain fishing for bottom/marine fish was worth $1,496 per trip in 1988 prices. The share value was adjusted to 1993 prices based on Survey of Current Business, consumer price index for all workers as shown below:

CONSUMER PRICES INDEX

All Workers

1993 / 1988 = 140.3 / 117.0 = 1.20 x $1,496 = $1,795

In addition to wages, the captain and crew also have their meals provided to them when at sea thereby increasing their overall per share value. The value of meals per day per person was estimated at $20.00. The value per person for meals based on a typical fishing trip lasting 4.5 days was estimated at $90.00. The per trip share value for a captain including meals was estimated at $1,885 ($1,795 + $90.00 = $1,885).

A trip was defined as lasting 4.5 days with actual fishing occurring 15 hours per day. Nine hours were allowed for sleeping and eating. Time spent fishing per trip was estimated at 67.5 hours. Based on the above information, the imputed hourly wage rate for trawl vessel captains was estimated to be $27.93 ($1,885 - 67.5 hours).

From 1986 through 1989 (latest available) the average per crew share adjusted for price level and including meals totaled $2,624 or $656 per person based on a 4 person crew. Imputed hourly wage rate for the crew was estimated at $9.72. Most trawl vessels fishing in the Neah Bay area have a captain and 4 crew members. Based on a hourly wage rate of $27.93 per captain and $9.72 per crew member, the weighted average hourly wage rate, shown below, was estimated to be $13.36. One third of this wage rate is $4.45 per hour and was used to quantify the value of time in this study. Revenue data was only available for trawl vessels but was assumed to be a proxy for all vessel types. This assumption most likely underestimates the true value of time saved for troller and urchin fishermen. Both vessel types accrue a time savings fishing for salmon (trollers) and urchins which have a higher market value than marine fish. As such, the value per share (and per hour) associated with these vessels is most likely higher than $4.45 per hour. Longline and trawlers fishing in the Neah Bay area are about the same size, fish the same fishery and have the same number of crew members and, as such, should have about the same per hour wage rate.

1 Captain x $27.93 = $27.93
4 Crew members x $9.72 = $38.88
Total $66.81 ÷ 5 persons = $13.36 Average Hourly Wage Rate

Value of Leisure Time = $13.36 x .333 = $4.45 per hour.

The value of time was quantified for both the decrease in vessel running time from marina to the fishing grounds and the decrease in vessel running time from the fishing grounds to the fish processor. Table 2-20 shows the computation of these benefits.

TABLE 2-20

VALUE OF TIME SAVED

Decreased Vessel Running Time to Fishing Grounds

Vessel Type	Miles Saved Per Year	Avg. Vssl. Speed	Annual Hours Saved Per Vessel	No. of People Per Vessel	Hours of Time Saved	Value per Hour	Value of Time Saved
Trawler	31,752	10	3,175	5	15,875	$4.45	$70,000
Longline	56,952	10	5,695	5	28,475	4.45	127,000
Troller	17,268	8	2,158	3	6,474	4.45	29,000
Urchin	55,200	25	2,208	3	6,624	4.45	10,000
Total Savings 1/							$236,000

Decreased Vessel Running Time From Fishing Grds. to Processor

Trawler	8,100	10	810	5	4,050	$4.45	$18,000
Longline	42,300	10	4,230	5	21,150	4.45	94,000
Urchin	29,100	25	1,164	3	3,492	4.45	5,000
Urchin	16,100	25	644	3	1,932	4.45	3,000
Total Savings 1/ 2/							120,000

1/ The $5,000 Urchin cost savings have been discounted as shown in footnote 1, table 2-18.

2/ The $3,000 Urchin cost savings have been discounted as shown in footnote 2, table 2-18.
table 2-17.

2.08 Summary of Project Benefits. A summary of average annual benefits which would accrue to this project is presented in table 2-21. Benefits are in October 1993 prices and have been annualized at 8.25 percent interest.

TABLE 2-21

SUMMARY OF AVERAGE ANNUAL BENEFITS
OCTOBER 1993 PRICES

Benefit Category	Average Annual Benefits
Transportation Savings	
Marina to Fishing Grounds	$367,000
Fishing Grounds to Fish Processor	176,000
Reduction in Vessel Damage	53,000
Reduction in Dock Damage	15,000
Savings in Vessel Launching Cost	35,000
Value of Time Saved	
Marina to Fishing Grounds	236,000
Fishing Grounds to Fish Processor	120,000
Total Benefits	$1,002,000

2.09 Project Costs. The cost of Section 107 projects consist of the Federal portion and the non-Federal portion. The Federal portion is that part of the project the Federal Government is authorized to participate in and includes construction of the breakwater, dredging and disposal of material from the entrance channel and turning basin, associated mitigation plus lands, easements, rights-of-way, relocations, borrow areas, and dredge material disposal dikes (LERRD) necessary for construction, operation and maintenance of the Federal part of the project. All other components are part of the non-Federal portion of the project (associated marina facilities) and consist of constructing, operating and maintaining the floats, piers, parking area, utilities plus dredging and disposal of the moorage basin and implementing associated mitigation features. First costs of the Federal and non-Federal project's facilities are shown in table 2-22 and total $7,741,000. Interest during construction was computed at 8.25 percent over a 6 month construction period resulting in a project investment cost of $7,901,000. The investment cost was annualized over the 50-year project life at 8.25 percent and total

$664,000 per year. Annual operation and maintenance costs are estimated at $75,000 per year resulting in a total annual cost of $739,000. All costs are in October 1993 prices.

TABLE 2-22

NEAH BAY PROJECT COSTS AT 8.25 PERCENT INTEREST AND OCTOBER 1993 PRICES

Project First Costs:	
Federal Project Costs	$4,090,000
Non-Federal Associated Project Costs	3,651,000
Total First Cost	$7,741,000
Interest During Construction (@ 8.25%, 6 Mo. Construction Period)	160,000
TOTAL INVESTMENT COST	$7,901,000
Average Annual Costs:	
Interest and Amortization (50-Years @ 8.25 Percent Interest)	$664,000
Operation, Maintenance and Replacements	
Federal Project	6,000
Non-Federal Project	69,000
Total Annual Cost	$739,000

2.10 Benefit-Cost Analysis. Benefits and costs are in October 1993 prices and have been annualized at 8.25 percent over the 50-year project life. Average annual benefits are $1,002,000; average annual costs are $739,000 yielding a benefit-cost ratio of 1.4 to 1. Net benefits total $263,000 per year.

2.11 Cost Sharing. The "Federal Project" and non-Federal project are defined in paragraph 2.09. The "Federal project" general navigation portion is cost shared between the Federal Government and project sponsor. Federal Government pays for 100 percent of the Federal Project operation and maintenance costs. The non-Federal project (i.e., associated marina facilities) costs are paid for by the project sponsor. Apportionment of "Federal project" costs was conducted in accordance with the Water Resources Development Act of 1986, Public Law 99-662.

a. Non-Federal Cost Sharing of the Federal Project Portion. Non-Federal project sponsor is the Makah Indian Tribe. Cost sharing of the estimated full funded (i.e., costs including inflation from October 1993 to the mid-point of construction) Federal Project construction costs was conducted in accordance with cost apportionment requirements of the Water Resources Development Act of 1986, Public Law 99-662 as amended. A project cooperation agreement (PCA) between the Department of the Army and project sponsor will be signed to ensure cost sharing requirements are met. Cost sharing requirements are as follows:

(1) The project sponsor shall provide at no cost to the Government all lands, easements, rights-of-way, relocations (including utilities), borrow areas and dredged material disposal areas (LERRD), as well as all marine lands, as determined by the Government to be necessary for construction, operation and maintenance of the Federal Project.

(2) The project sponsor shall provide upfront a cash contribution equal to 10 percent of the total actual cost of constructing the general navigation features of the project. Since this project has a less than one year construction period, these funds must be provided by the project sponsor to the Federal Government prior to the start of construction contract award.

(3) The project sponsor, at his option, shall either repay without interest, a lump sum at the end of construction and within 90 days of final accounting or in annual installments with interest over a period not to exceed 30 years following completion of the project or separable element thereof, an additional 10 percent of the total actual cost of constructing general navigation facilities minus a credit based on the value of LERRD associated with the Federal project. The value of any lands, easements and rights-of-ways pertaining to the Federal project but subject to navigation servitude are considered marine lands and are non-creditable and cannot be used as a credit towards the additional 10 percent.

The computation of Neah Bay general navigation costs and the credit allowed toward the additional 10 percent of general navigation costs are shown in table 2-23.

TABLE 2-23

COMPUTATION OF GENERAL NAVIGATION COSTS AND ALLOWED CREDIT

Total Full Funded Federal Project Cost		$4,377,000
Less:	Creditable LERRD	58,000
	Non-Creditable Marine Lands 1/	51,000
	Navigation Aids	4,000
General Navigation Costs		$4,264,000

Computation of Credit Allowed Toward Additional 10 Percent

Creditable LERRD $58,000 = 1.4 % of General Navigation
Gen. Nav. $4,264,000

1/ Economic value assigned to land subject to navigation servitude.

b. Non-Federal Associated Marina Facilities. The sponsor is responsible for constructing and paying for all associated marina facilities such as dredging and disposal of dredge material from the moorage basin, piers, floats, docks, and mitigation associated with dredging the moorage basin. All of the associated marina facilities must be constructed during the construction period of September through March.

The estimated full funded cost of the non-Federal portion of the project is $3,907,000 ($3,864,000 construction cost plus $43,000 for the value of non-creditable lands). The project sponsor is also responsible for 100 percent of operation, maintenance and replacement costs of this portion of the project. These annual costs are estimated at $75,000 in 1996 prices; assuming a 3.0 percent per year price level increase between 1993 and 1996.

c. Total Non-Federal Cost Share. Based on the above full funded estimated project costs and computation of creditable LERRD, the project sponsor will receive a credit of 1.4 percent toward the additional 10 percent of Neah Bay general navigation costs. Total non-Federal cost responsibilities are therefore comprised of (1) creditable and non-creditable LERRD, (2) 18.6 percent of general navigation costs and (3) 100 percent of the non-Federal portion of the project. Itemized non-Federal construction costs and annual operation, maintenance and replacement costs requirements are shown in table 2-24.

TABLE 2-24

ITEMIZED NON-FEDERAL ESTIMATED SHARE OF COSTS
FULL FUNDED DOLLARS

Federal Project

	Non-Federal Share	
Construction Costs - Federal Project	Cash	Non-Cash
Creditable LERRD		$58,000
Non-Creditable Marine Lands 1/		51,000
Gen. Navigation - Upfront ($4,264,000 x .10)	$426,000	
Gen. Navigation - Repay. ($4,264,000 x.086)	367,000	
Sub-Total - Non-Federal Share	$793,000	$109,000

Non-Federal Project

	Cash	Non-Cash
Construction Costs - Non-Federal Project		
Marina Lands		$43,000
Navigation, Ports and Harbors 2/	$3,864,000	
Sub-Total - Non-Federal Share	$3,864,000	$43,000
Grand Total - Non-Federal	$4,657,000	$152,000

1/ Economic value assigned to navigation servitude lands.

2/ Includes dredging and disposal, moorage facilities and mitigation.

Non-Federal Project Annual Operation,
Maintenance and Replacement Costs (1996 Prices) $75,000

Non-Federal share of the Federal Project costs consist of (1) cash paid up front to the Federal Government, (2) repayment of cash to Federal Government or paid upfront to Federal Government and (3) non cash required items (i.e., Marine Lands). See table 2-24 for apportionment of Federal project costs.

d. Federal Cost Share. Federal entities consist of the Corps of Engineers and the Coast Guard. For this project, the Corps of Engineers will pay an estimated 81.4 percent of general navigation costs which consists of the breakwater and associated mitigation. This cost is estimated at $3,471,000. The Corps will also pay for 100 percent of the operation and maintenance costs of the Federal Project which is estimated at $6,000 per year in 1993 dollars. The Coast Guard will pay for the aids to navigation and is estimated to cost $4,000. Estimated Federal full funded cash requirements by work item are shown in table 2-25.

e. Federal Limit on Project Costs. The 1986 Water Resource Development Act established a study and construction cost plus the discounted value of operation and maintenance cost limit on Section 107 projects. This limit is 2.25 times the Government share of planning (reconnaissance and feasibility reports) and construction costs with the Government's share of planning and construction costs not to exceed $4,000,000. For this project, which has an estimated Federal share of planning and construction costs of $3,845,000 ($4,268,000 from table 2-23 + $90,000 Recon. Rpt. + $280,000 Feas. Rpt. - $793,000 from table 2-24), the total Federal cost limit which includes the construction and planning costs plus the discounted value of Federal operation and maintenance costs is estimated at $8,651,000 ($3,845,000 x 2.25).

TABLE 2-25

FULL FUNDED FEDERAL AND NON-FEDERAL ESTIMATED COST SHARING REQUIREMENTS (Thousands of $)

Federal Project

		Non-Federal Type of Funds		
Work Item	Federal Cash	Cash To Gov't	Non-Cash	Total
LERRD			$58	$58
Marine Lands			51	51
Fish and Wildlife	$11	$2		13
Breakwaters and Seawalls	3,102	709		3,811
Engineering and Design	131	30		164
Construction Mgmt.	227	52		276
Aids to Navigation	4			4
Subtotal	$3,475	$793	$109	$4,377

2.12 Financial Analysis. The purpose of the financial analysis is to help ensure that the project sponsor understands the financial commitment involved and has a reasonable plan for meeting that commitment. The financial analysis consists of: (1) the project sponsor's Statement of Financial Capability, (2) sponsor's financing plan, plus (3) Corps of Engineers assessment of the sponsor's financial capability.

a. **Financing Plan.** (To be provided by sponsor)

b. **Statement of Financial Capability.** (To be provided by sponsor)

c. **Assessment of Financial Capability.** (To be provided upon receipt of above information).

APPENDIX D

ANALYSIS OF DESIGN AND ESTIMATES OF COST

APPENDIX D - ANALYSIS OF DESIGN AND ESTIMATES OF COST

TABLE OF CONTENTS

SECTION 3. COST ESTIMATE AND SCHEDULE

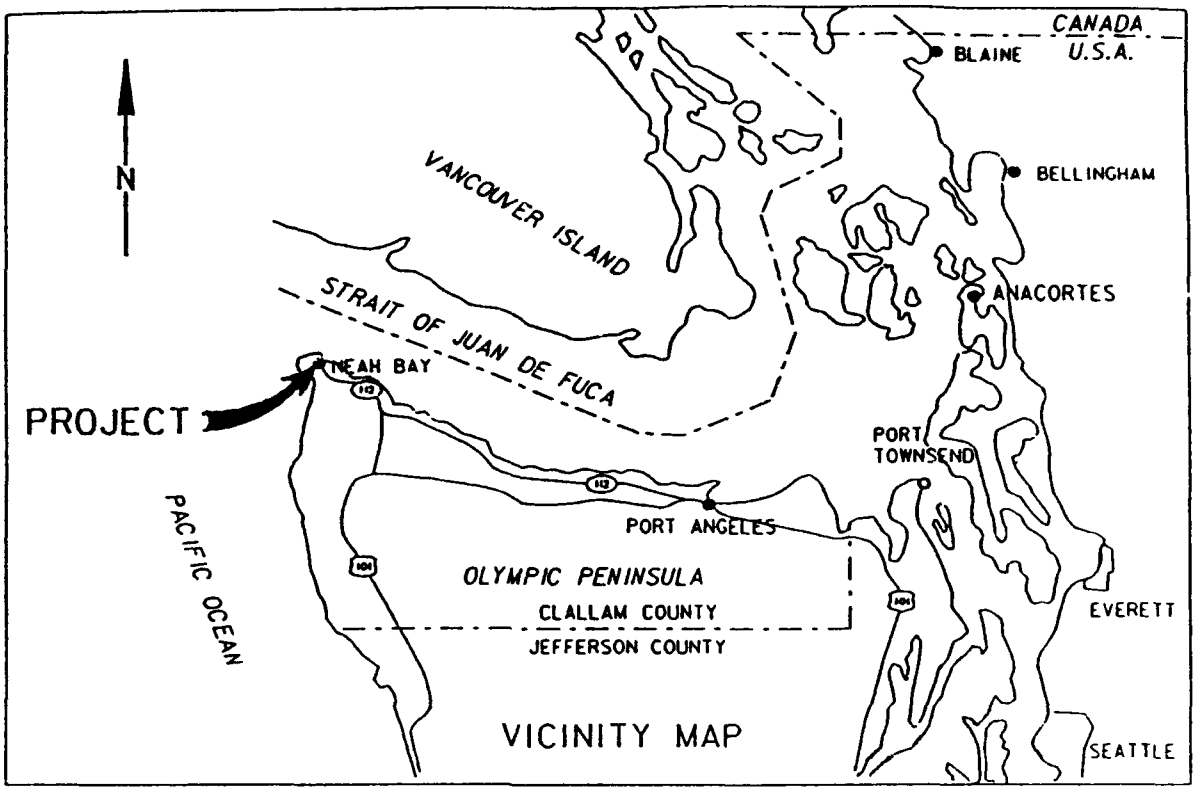
APPENDIX D - ANALYSIS OF DESIGN AND ESTIMATES OF COST

1.01 Site Description.

a. Location. Neah Bay is located approximately 150 miles northwest of Seattle,Washington, at the entrance to the Strait of Juan de Fuca. The proposed marina site is situated on the southern shore of Neah Bay, approximately one mile west of the Bay entrance (see figure D-1).

b. Existing Projects. The River and Harbor Act of 20 June, 1938 authorized the construction of a 8,000-foot-long rock breakwater between Waadah Island and the westerly shore of Neah Bay. The breakwater was constructed in 1941, providing protection from ocean generated waves. A 1,500-foot-wide natural entrance is located at the east end of the bay between Waadah Island and Baadah Point. The authorized project was modified in 1954 to include 2 revetments extending approximately 3,000 feet westward from Baadah Point. An additional 1,200-foot-long revetment, constructed by the Corps of Engineers in 1990 under Section 14 of the 1946 Flood Control Act, essentially completed the shoreline armoring from Baadah Point to the location of the proposed project. The harbor is used in the spring and summer by recreational fishermen, and year round by commercial fishermen and by the U.S. Coast Guard which maintains a station there.

c. Prior Studies. A Section 107 reconnaissance study was conducted in 1980, but the project was found to be economically infeasible. The Northern Olympic Peninsula Shallow Draft Navigation Improvement Study (NOPSD), a General Investigation reconnaissance study was conducted in 1983 - 1988 proposing a commercial marina and logship channel in Neah Bay. The improvements were found economically infeasible at the time. Investigations of foundation conditions and tidal currents that were carried out during the NOPSD study have been utilized in the design of the present project. In addition, studies related to the initial construction and subsequent maintenance of the breakwater and revetments have been utilized.


CANADA
U.S.A.
BLAINE
BELLINGHAM
N
VANCOUVER ISLAND
STRAIT OF JUAN DE FUCA
ANACORTES
NEAH BAY
PROJECT
PORT TOWNSEND
PORT ANGELES
PACIFIC OCEAN
OLYMPIC PENINSULA
CLALLAM COUNTY
JEFFERSON COUNTY
EVERETT
VICINITY MAP
SEATTLE

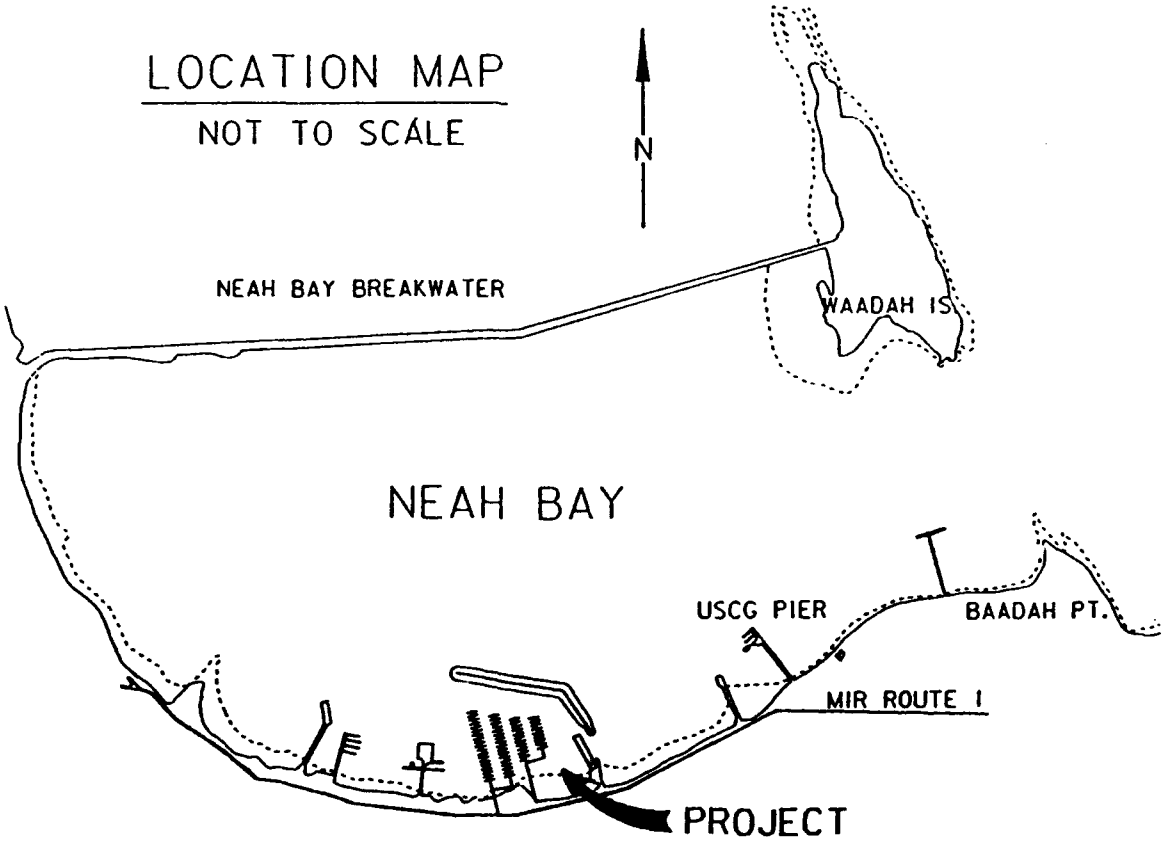

LOCATION MAP
NOT TO SCALE
N
NEAH BAY BREAKWATER
WAADAH IS
NEAH BAY
USCG PIER
BAADAH PT.
MIR ROUTE I
PROJECT

FIGURE D-1

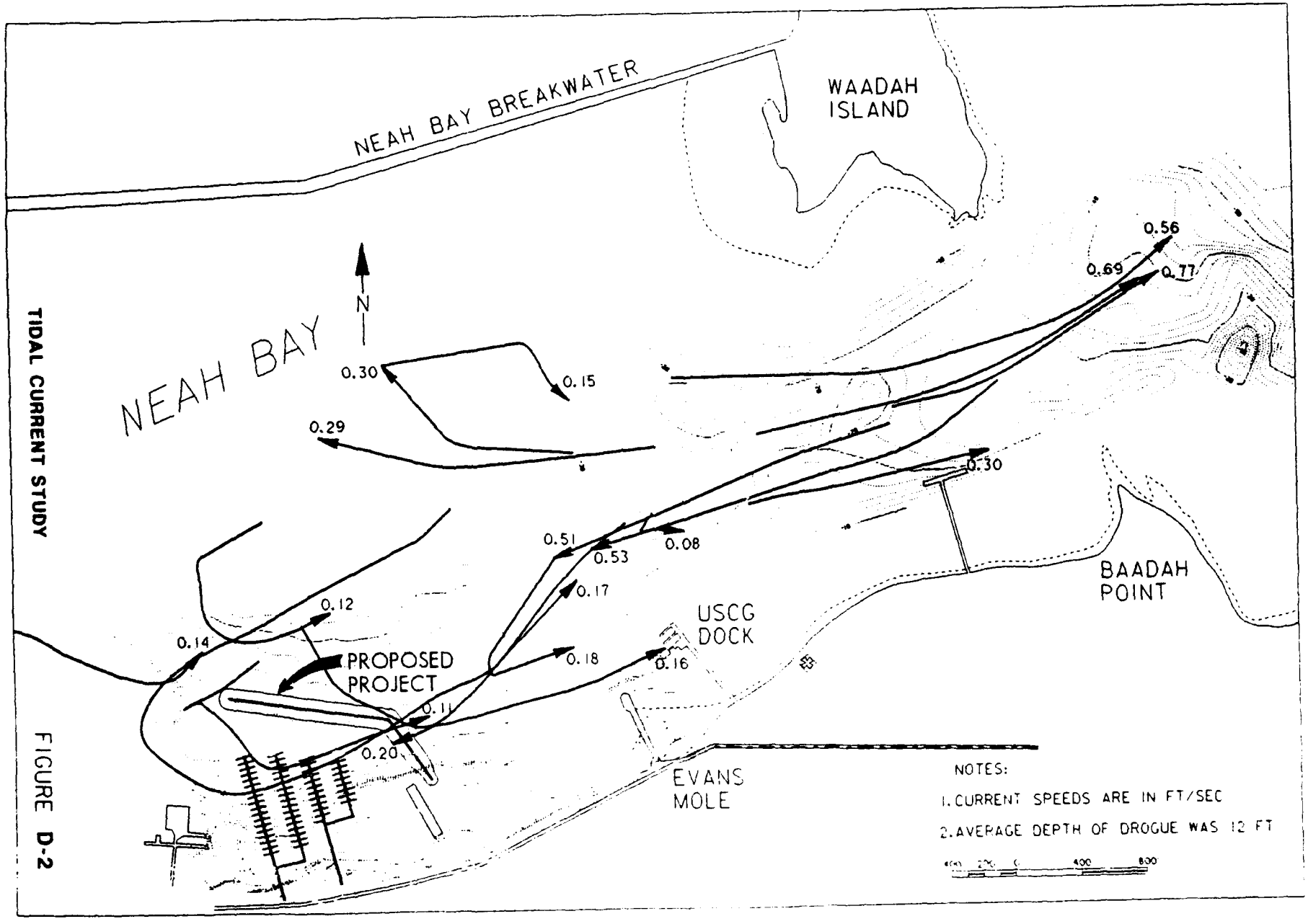
1.02 Tides and Tidal Currents. Tides at Neah Bay are typical of the Pacific coast of North America. Tides are of the mixed type with two unequal highs and lows each day. Tidal range datums for Neah Bay, as published by the National Ocean Service, are as follows:

DATUM PLANE	ELEVATION REFERRED TO MLLW
Highest Tide (Estimated)	12.00
Mean Higher High Water	7.90
Mean High Water	7.10
Mean (Half) Tide Level	4.35
NGVD	4.22
Mean Low Water	1.60
Mean Lower Low Water	0.00
Lowest Tide (Estimated)	-3.80

The Strait of Juan de Fuca is subject to strong, irregular currents and to rip currents off prominent points such as Waadah Island. Tidal currents entering and leaving the harbor at Neah Bay through the entrance channel can exceed 1/2 knot; however currents in the vicinity of the proposed marina are weak. Tidal currents in Neah Bay were measured by the Corps of Engineers in July 1986. The currents were measured by tracking the paths of drogues over a period of three days. Drogue paths are shown on figure D-2. The drogues indicate that tidal currents in the vicinity of the proposed marina site are minimal, and will seldom exceed 0.2 fps.

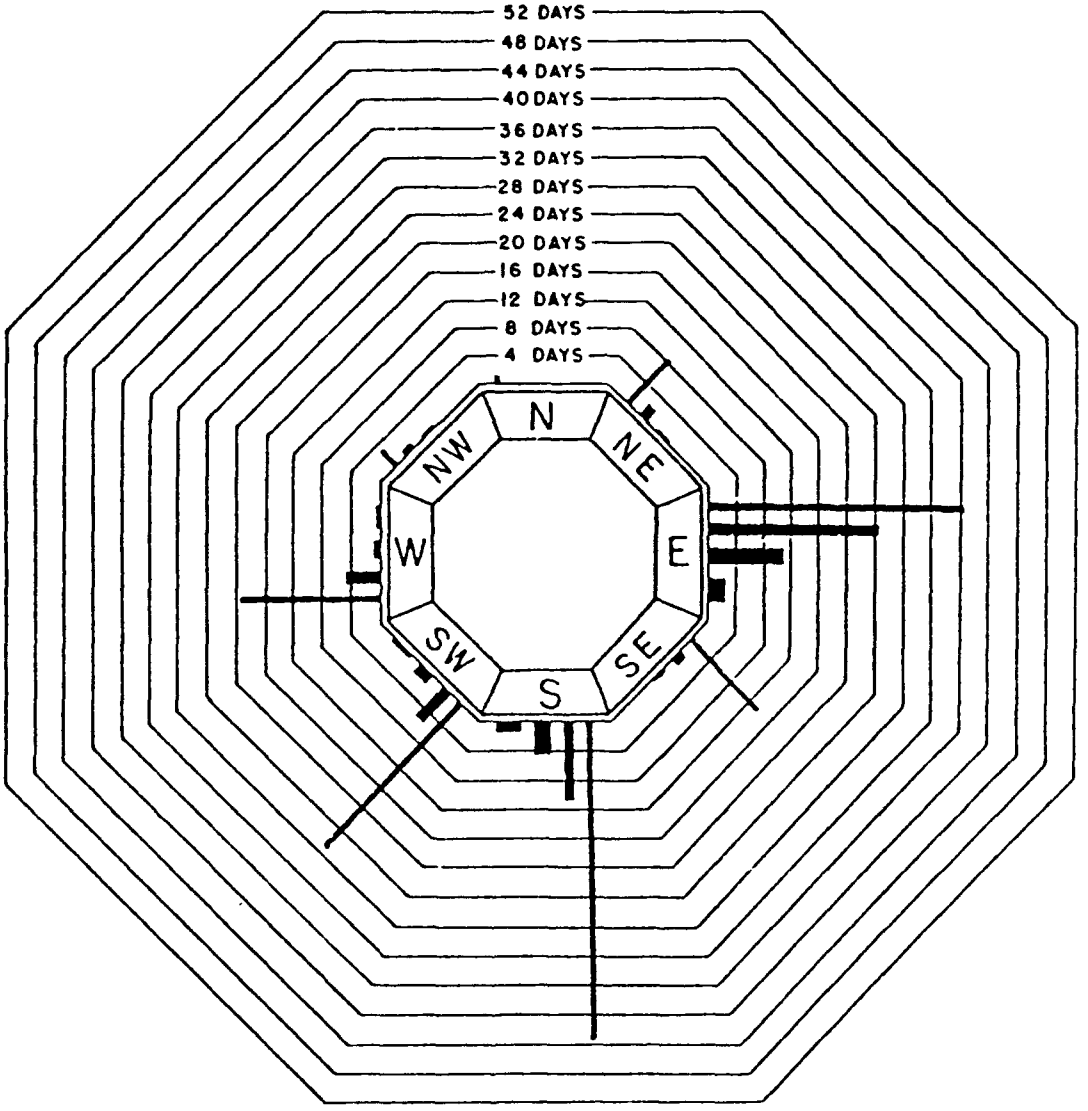
1.03 Prevailing Winds. Wind data at Tatoosh Island indicate a prevailing easterly wind direction in the fall and winter and a westerly direction in the summer. The strongest winds are from the east and northeast, sometimes reaching speeds in excess of 80 miles per hour. The average yearly wind diagram and velocity-duration curves for Tatoosh Island, Washington (located approximately 5 miles northwest of Neah Bay) are shown on figures D-3 and D-4.

1.04 Wind Generated Waves. The harbor entrance is exposed to wind waves from the east, and northeast, and to ocean swell from the north and northwest. The proposed marina site is located well within the bay, and is exposed only to waves from the east and northeast that pass through the entrance, or to waves generated within the bay itself. The Wind Speed Adjustment and Wave Growth application in ACES version 1.07 was used to calculate wave heights and periods for easterly waves generated in the Strait of Juan de Fuca and for waves from the north and northeast generated within the bay. For the 20 to 90 statute mile fetch to the northeast and east, (50 statute miles used), a 48-mph wind with a 5-hour duration was calculated to generate a duration limited significant wave height, H_{mo}, of 14 feet with a period, T_p, of 8 seconds. As this wave enters the bay,



TIDAL CURRENT STUDY

FIGURE D-2



PERIOD: 1939 TO 1947

LEGEND

VELOCITY RANGE M.P.H.	
10 to 20	
Over 20 to 30	
Over 30 to 40	
Over 40	

AVERAGE YEARLY WIND DIAGRAM

TATOOSH ISLAND, WASHINGTON

FIGURE D-3

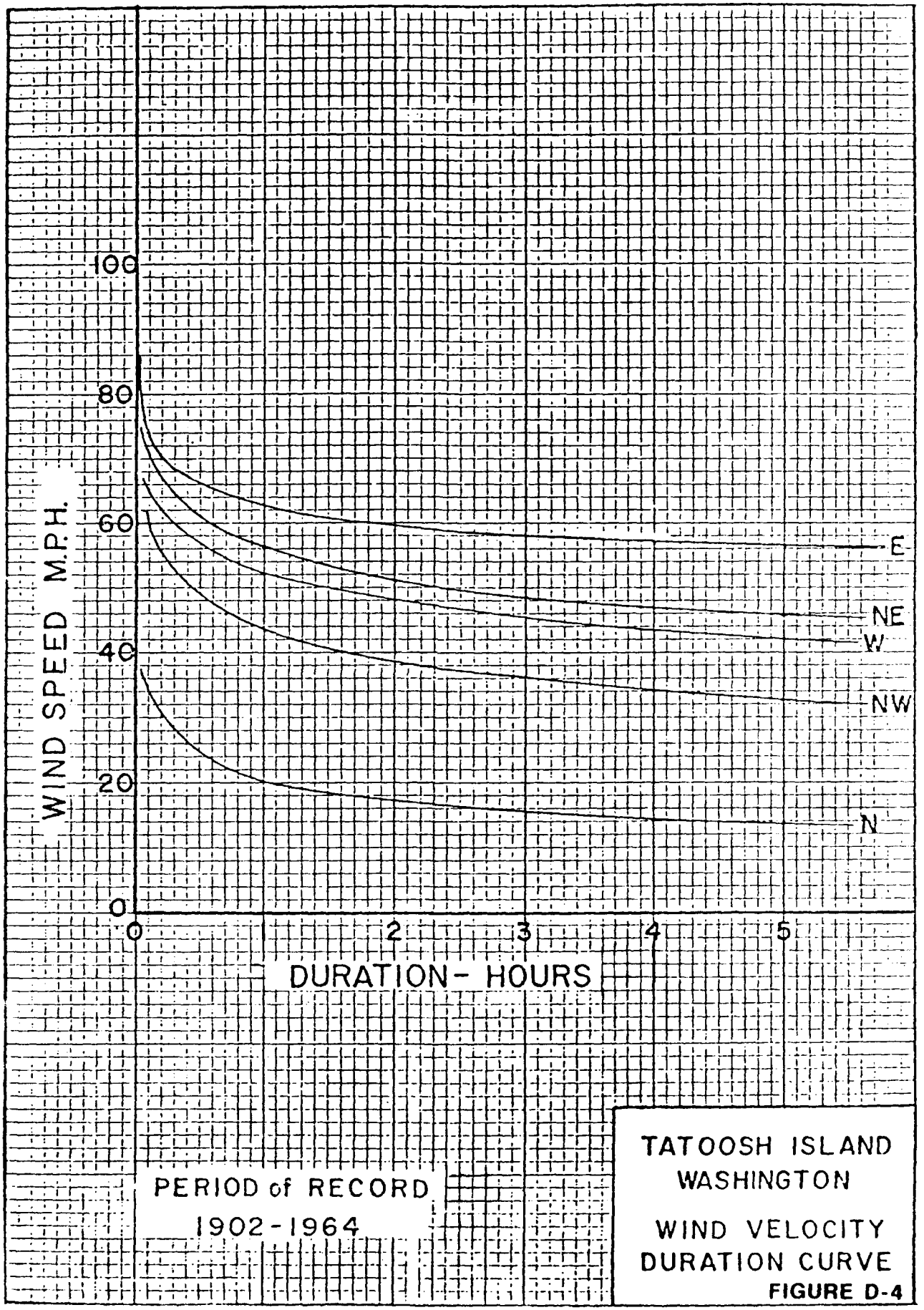

WIND SPEED M.P.H.
100
80
60
40
20
0
0
2
3
4
5
DURATION - HOURS
E
NE
W
NW
N
PERIOD of RECORD
1902 - 1964
TATOOSH ISLAND
WASHINGTON
WIND VELOCITY
DURATION CURVE

FIGURE D-4

refraction and shoaling effects reduce the wave height to 7.5 feet, see figure D-5. This wave height is consistent with previous wave estimates that have been made over the past 50 years during the rehabilitation and extension of the Corps of Engineers revetment that extends along the south shore of Neah Bay from Baadah Point to the proposed project location. Except for the most protected areas, estimated wave heights have varied from 8 feet near the entrance to 5.5 feet immediately east of the proposed project. The extremely irregular bathymetry and shoreline in the harbor entrance, and the lack of deep water wave data, make the results of this, and previous wave analyses only approximate. For the same reasons, even wave estimates using the most sophisticated numerical or physical models would be suspect unless a great deal of additional field data were obtained. However, revetment rock sizes and top elevations based on past (albeit crude) wave estimates, have proven to perform quite satisfactorily. For this reason, the 7.5 feet wave calculated in this analysis was used to determine armor rock size and design the breakwater top elevation. To assure that this conservative approach does not add excessive cost to the project, a sensitivity analysis was carried out to determine the approximate cost savings that could be realized if a smaller design wave were used to calculate armor rock size (see paragraph 2.03 e).

Wind waves generated within the bay are not a significant design consideration. Wave heights generated within the bay are 2.2 feet, 0.7 feet, and 1.8 feet from the northeast, north, and northwest respectively, see figure D-5.

1.05 Littoral Transport. The littoral processes within Neah Bay were altered significantly by construction of the breakwater across the north side of the bay in 1941, and by construction of revetments that extend nearly uninterrupted from Baadah Point to the west end of the bay, essentially armoring the entire southern shore. Several groin-like structures located along the southern shoreline, such as Evans mole, trap material on their east side, indicating that the predominant littoral drift direction is now from the east to the west. However, there is no readily apparent source of littoral material. Baadah Point and the rocky headland to the east of Baadah Point appear to present a significant obstacle to the transport of sediments into the bay. Diver observations indicate that the rocky portion of Baadah Point extends to a depth of about 30 feet, where a sandy bottom is encountered. Some of this sand may find its way into the bay, but nearshore littoral processes probably are limited to a rearranging of sediment that was in the system prior to construction of the breakwater and revetments. The shore from Baadah Point to Evans mole was revetted between 1941 and 1956 and the beach in this area is now at an elevation of approximately 0 ft MLLW. Moving farther west, a comparison of 1961 and 1993 hydrographic surveys indicates that, along the portion of the shoreline between Evans mole and the proposed marina site, the

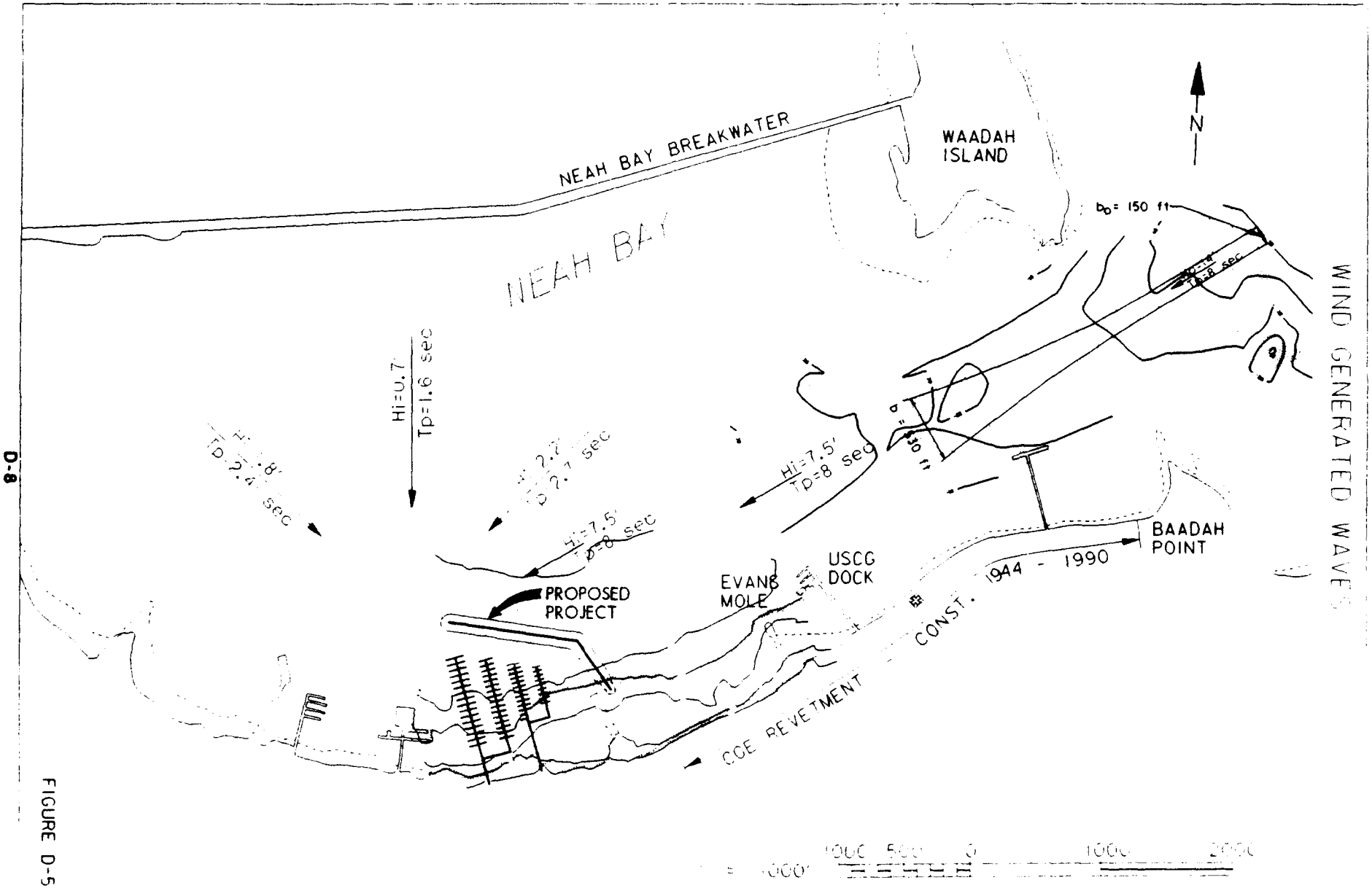

NEAH BAY BREAKWATER
NEAH BAY
WAADAH ISLAND
N
WIND GENERATED WAVES
b_0 = 150 ft
Hi=7.5'
Tp=8 sec
Hi=7.5'
Tp=8 sec
Hi=7.5'
Tp=8 sec
Hi=0.7'
Tp=1.6 sec
PROPOSED PROJECT
EVANS MOLE
USCG DOCK
CONST. 1944 - 1990
BAADAH POINT
COE REVETMENT
1000 500 0 1000 2000

FIGURE D-5

beach has undergone significant erosion. In the last 30 years the +4-ft MLLW contour has advanced landward nearly 200 feet, forming a broad wave-cut bench between elevations -4 ft and +4 ft MLLW, and causing the beach profile to go from its natural slope of approximately 1V on 20H to a unnaturally shallow slope (for this area) of approximately 1V on 200H. The erosion in this area may have been accelerated by the construction of Evans mole in 1965. In 1990 a revetment was constructed along this reach of the shoreline by the Corps of Engineers to protect the adjacent road and utilities. Farther west, a significant amount of material has been deposited in the vicinity of the proposed marina site. The deposited material is probably a combination of sediment deposited by a small stream that enters the bay at this point, and sediment that was trapped by the small delta created by the stream. From the proposed marina site westward, much of the southern shoreline has been commercially developed and revetted. Only the western shore of the bay remains a natural beach. This beach has a very gentle slope (1V on 100 H), shows little evidence of significant littoral transport in either direction, and appears to have reached equilibrium with the existing wave climate.

1.06 Sea Level Rise. Measurements made between 1935 and 1972 indicate that sea level at Neah Bay is actually falling at a rate of about 13 cm/century, (Downing, The Coast of Puget Sound). The drop of sea level is probably due, in part, to upward ground movement of the earth's crust in this area. Unless there is a dramatic change in this rate, sea level rise (fall) should not have any effect on the operation or maintenance of the proposed marina project over its 50-year design life.

1.07 Geology. The rock underlying Neah Bay is sandstone of the Twin Rivers Formation. This rock is suspected to be gently north sloping with a 20 to 40-foot-thick wedge of silty sand and gravel overlying the rock at the shoreline thinning to a small prism in mid channel. The rock has pinnacles and gravel filled depressions throughout. Pile driving records, kept by the Makah Tribe, indicate that 65-foot-long wood pilings were driven in the vicinity of the proposed marina using a Vulcan #1 hammer at 60 strokes per minute. A ram weight of 5000 pounds, driving cap, anvil and helmet weight of 12,000 pounds were used. Based on these records, the sand in this area appears to to be dense and quickly develops pile driving blow counts of 25 to 40 after about 8 feet of penetration. The records indicate that up to five feet of soft sediment, log debris, cable debris, and silt and sand, is overlying the denser silty sand in some locations. Pile driving blow counts in the soft sediment varied from 0 to 12.

1.08 Subsurface Exploration. Subsurface exploration for the Neah Bay project was conducted by Seattle District, Corps of Engineers on May 10 through 14, 1993. Twelve Vibracore test holes were drilled, to depths ranging from 2.6 to 12.5 feet,

using a 3-inch diameter Rossenfelder Vibracore sampler. Six borings were made within the proposed marina moorage area where dredging will be required, and six borings were made along the alignment of the proposed breakwater. The borings taken along the breakwater alignment were visually classified according to the "Unified Soil Classification System." Based on these visual observations, the surface layer along the breakwater alignment consists of 0 to 6 feet of silty sand with shells near shore which is underlain by 7 feet of sand with small gravels of undetermined thickness. Away from shore, the surface layer consists of up to one foot of silt underlain by up to 2.5 feet of sand and silt mixtures (silty sand with silt layers), and silty sand with shells and gravels of undetermined thickness. One boring, 93-VC-3, encountered silty sand to a depth of 12 feet. The locations of the twelve test holes are shown on plate 1. Logs of the six borings made along the breakwater alignment (93-VC-1 through 93-VC-6) are shown on plate 2. Particle size analyses are found in Exhibit D-1 at the end of this appendix. The six samples taken from the area to be dredged were not visually classified, but were tested for chemical and physical characteristics in accordance with Puget Sound Dredged Disposal Analysis (PSDDA) guidelines. All samples were found to be acceptable for disposal in open water.

1.09 Existing Mooring Conditions. Safe year round moorage is not possible under existing wave conditions. During the winter months, waves passing through the bay entrance frequently exceed 3 feet in height. Mooring floats are removed each fall to prevent damage, and few fishing boats remain at anchor within the bay. Those boats that do remain in the bay often drag anchor and several vessels are damaged or destroyed each winter. Docks and floats that cannot be removed sustain constant damage from waves and wave borne debris.

SECTION 2. DESIGN FEATURES AND ANALYSIS OF THE RECOMMENDED PLAN

2.01 General. This section presents the design features and analysis of constructing a marina capable of accommodating approximately 250 commercial fishing vessels. The present wave conditions at Neah Bay prevent safe moorage of any size vessel during fall and winter months. Travel times for fishing vessels enroute to winter fishing grounds are well documented and significant transportation cost savings could be realized if winter moorage were available at Neah Bay.

2.02 Proposed Project. The main design features of the project include a 350-foot-long east breakwater, a 1,450-foot-long north breakwater, an entrance channel, moorage basin, fish passage area, temporary dredging disposal area, and mitigation area. The recommended plan provides for the following:

- o Federal construction and maintenance of the breakwaters protecting the proposed boat basin.
- o Designation of a Federal entrance channel and main entrance to -15 feet MLLW, if shoaling occurs.
- o Federal maintenance of fish passage opening and disposal of maintenance dredged material at an adjacent beach nourishment site used as project mitigation.
- o Federal monitoring of beach nourishment and productivity at the adjacent mitigation site.
- o Non-Federal construction and maintenance dredging of the boat basin for moorage of commercial fishing boats.
- o Non-Federal construction and maintenance of all project associated marina facilities such as moorage floats, access ramps and docks, work and fuel docks, and wharfs for commercial fishing boats, pontoon access bridge, and pontoon deck maintenance for purposes of using it as a work area.

2.03 Marina Design. In determining the marina design, major considerations were those related to providing safe year round moorage for the number and size of commercial vessels that were anticipated to take advantage of the new facility. The selection of marina dredged depth, channel widths, and float layout was dependent upon the length, beam, and draft of expected vessels. Factors considered in the location and alignment of the marina and breakwaters were: existing bathymetry, direction of wave approach, fish migration, minimizing disruption of shallow intertidal areas, and maximizing marina flushing.

a. Design Vessel. Based on information obtained by the

Corps of Engineers and by the Makah Tribe, approximately 208 commercial fishing vessels would utilize the proposed marina. Most of the vessels that would moor at Neah Bay would be 30 to 70 feet in length with drafts between 8 and 12 feet.

b. Marina Design Layout and Depth. The marina layout was made assuming a requirement to moor 208 boats. Based on the predicted fleet mix, slip length varies from 30 feet to 70 feet. The following table shows the number of slips planned for each slip length.

NUMBER OF SLIPS	SLIP LENGTH
34	30 ft
46	45 ft
62	50 ft
31	60 ft
31	70 ft
4	60 - 150 ft

The Permanent International Association of Navigation Congresses, (PIANC) recommends the width of marina access channels be 1.5 to 1.75 times the vessel length. Based on this guidance the access channel widths for the proposed project vary from 80 feet to 100 feet.

Approximately 70 percent of the slips are located where the existing water depth is 15 feet or greater. The remainder of the basin will be dredged to a depth of -15 ft MLLW where vessels with a draft of 10 feet or less will be moored. (This maximum draft assumes a minimum tide condition of -4 ft MLLW and one foot of clearance).

Maintaining a near shore fish passage area, minimizing the loss of shallow intertidal areas between -2 ft MLLW and +2 ft MLLW, and maintaining superior flushing characteristics were primary considerations in determining the placement and orientation of the marina and breakwaters. The final layout of the boat basin and breakwaters was produced through a combined effort by the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the Makah Tribe, the Corps of Engineers, and the Washington State Departments of Fisheries and Ecology.

The 19-acre moorage area would have a project depth of -15 feet MLLW as shown in the non-Federal portion of the permit

application included in the public notice in appendix A, Part 2. An estimated 50,000 cubic yards, which includes 1 foot of overdepth allowance, would be dredged from the moorage area. The project depth is adequate for navigation safety and moorage of the vessels expected to use the marina at all tide levels.

c. Final Variations Considered. During the design process, numerous marina locations and orientations were considered within the central Neah Bay area. Of these, four variations were evaluated in detail. See figure 3-2 of the main report. In all of the variations, two breakwaters were used to provide wave protection on the north and east sides. The proposed site is sheltered by the natural shoreline on the west side. All the breakwaters follow a similar alignment in which the east breakwater extends approximately 350 feet into the bay in a northerly direction. The north breakwater is aligned in a dog-leg shape that extends in a northwesterly direction for approximately 450 feet, then rotates approximately 55 degrees to follow an east-west alignment for an additional 1,000 feet. The north breakwater is separated from the east breakwater by approximately 50 feet to provide a passage for the near shore migration of juvenile salmon.

(1) Variation 1. In variation 1, a 350-foot-long by 59-foot-wide by 16-foot-high concrete pontoon salvaged from the Interstate-90 (Lake Washington) floating bridge would be utilized to construct the east breakwater. The pontoon would be moved into place and grounded at high tide, then ballasted with sand or gravel to fix it in place. The north breakwater would be a rubblemound structure with a top elevation of +18 ft MLLW. At station 9+60, the elevation of the breakwater crest would drop to an elevation of -1 ft MLLW. From station 9+60 to station 19+30, the upper portion of the breakwater would be constructed of steel H-pilings placed on 6-foot centers and 8 ft by 6 ft by 10-inch-thick concrete panels that would be attached to the pilings. This vertical portion of the breakwater would extend from elevation -1 ft MLLW to +17 ft MLLW. For variation 1, the cost of the two breakwaters, including quantity and cost contingencies would be approximately $ 3.9 million.

(2) Variation 2. In variation 2, the east breakwater, and the first 460 feet of the north breakwater (to station 9+60) would be identical to that in alternative 1. However, in variation 2, the rubblemound portion of the north breakwater would terminate at station 9+60, where the structure turns to the west. From this point to the end of the breakwater (station 19+30), the steel piling and concrete panels would extend for the full 40-foot-height of the structure. Without the support of the rubblemound foundation, piling spacing would have to be reduced to 4 feet, and each piling would require a batter pile. For variation 2, the cost of the two breakwaters, including quantity and cost contingencies would be approximately $ 5.3 million.

(3) Variation 3. In this variation, the east breakwater again would utilize the concrete bridge pontoon as in variations 1 and 2, but the north breakwater would be constructed entirely of rock for its full length. The top elevation would be +18 ft MLLW for the entire 1,450-foot length. For variation 3, the cost of the two breakwaters, including quantity and cost contingencies would be approximately $3.58 million.

(4) Variation 4. The north breakwater in variation 4 would be identical to that described for variation 3. For the east breakwater, the bridge pontoon would be replaced by a rubblemound breakwater with a top elevation of +18 ft MLLW. For variation 4, the cost of the two breakwaters, including quantity and cost contingencies would be approximately $3.59 million.

d. Selected Alternative. Variation 3 was selected as the preferred alternative. This alternative was found to be the least cost alternative. In addition, variation 3 had several features that were considered to be desirable. First, the bridge pontoon, used in the east breakwater, would provide a large working area for marine related tasks such as net mending, gear repair, etc. Second, a quarry is located within 3 miles of the project that meets the rock specifications of approximately 20,000 cy of 2 to 4 tons per piece armor stone and approximately 161,000 cy of quarry spalls. Selective quarrying would be necessary. There are 8 additional quarries within a 35 mile radius of Neah Bay that may be able to supply the required rock. Finally, the breakwaters could be constructed in a relatively uncomplicated manner utilizing readily available earth moving equipment.

e. Details of the North Breakwater Design. The proposed north breakwater has a total length of 1,450 feet, and would be a rubblemound structure with a structure slope of 1V on 1.5H, and a top elevation of +18 ft MLLW. The crest and face of the breakwater would be protected with a layer of armor rock that extends from the top to an elevation of -5 ft MLLW. The Breakwater Design application in ACES 1.07 was used to calculate armor stone size and armor layer thickness. For a design wave height H_s = 7.5 ft, a stability coefficient K_d = 2.00, a structure slope of 1.5 (ie. 1V on 1.5 H), and an armor stone unit weight w_r = 165 lb/cf, the individual armor unit W, is 3 tons. The Corps of Engineers' Shore Protection Manual (SPM) recommended rock size limits are 0.75W to 1.25W, or 2.25 to 3.75 tons. An armor stone gradation of 2 to 4 tons, with 50% greater than 3 tons was selected for the breakwater design. For an armor layer that is 2 units thick, ie., n = 2, the layer thickness, r = 7 feet, and the top width is 11 feet. The wave runup elevation for the 7.5 foot design wave was calculated assuming a still water elevation of +11 ft MLLW. Using the Wave Runup, Transmission, and Overtopping application in ACES 1.07, the runup elevation for the proposed breakwater was determined to be +22.5 ft MLLW. This

value is comparable to the top elevation of the south shore revetment which varies from +24 ft at the eastern end to +16 ft near the proposed project. In addition, Evans Mole, and the rock fill that extends into the bay at the project site, both have a top elevations of approximately +20 ft MLLW. Construction of the breakwater to a top elevation of +18 ft would allow some overtopping during severe conditions (extreme tide and high waves), but appears to be a conservative average of existing experience. The north breakwater is separated from the east breakwater to provide a 50-foot-wide passage for juvenile salmon that may migrate along the south shore of Neah Bay. A haul road for constructing the north breakwater would extend down the top of the east breakwater, then across the fish passage between the east and north breakwaters, and then down the north breakwater alignment. The haul road would be constructed to an elevation of +11 ft MLLW to allow work to proceed during all but the highest tide conditions. Final placement of the armor rock would bring the top elevation to +18 ft MLLW. The north breakwater would require 190,000 cy (300,000 tons) of rock and would cost approximately $3.4 million.

As discussed in paragraph, 1.04 of this appendix, a detailed wave analysis, probably involving a numerical or physical model might allow the design wave to be reduced to as small as 5.5 feet. For a design wave height H_s = 5.5 feet, the individual armor unit size would be 1.5 ton. The resulting layer thickness would be 5 feet, and the top width 8 feet. Thus, 8000 cubic yards (c.y.) of armor could be saved, reducing the total breakwater cost by approximately $125,000. Since a detailed wave study would cost a significant portion of the potential savings, a decision was made to proceed with a conservative approach and use the 7.5 foot wave for this level of design.

EM 1110-2-1615 states, "a two-foot wave is acceptable in moorage areas for large fishing vessels." Since the proposed project is designed for 100% commercial fishing vessels, a two-foot wave was selected as an acceptable wave height within the marina. The Combined Diffraction and Reflection by a Vertical Wedge application in ACES 1.07 was used to calculate diffracted wave heights within the proposed marina. The 7.5 foot wave that approaches through the entrance to Neah Bay is reduced to 1.8 feet within the marina and the wave approaching from the northeast is reduced to 0.3 foot. The marina entrance is exposed to waves approaching from the north and northwest, but these waves are less than 2-feet-high. Thus, the interior wave height will be within the EM guidelines under all design conditions.

f. Details of the East Breakwater Design. The proposed design for the east breakwater utilizes a concrete pontoon that was once part of the Lake Washington floating bridge (Interstate 90). The bridge was severely damaged when a portion sank during a storm in November 1990. The Makah Tribe purchased five of the

surviving pontoons and transported them to Neah Bay, with the intention of using at least one of the pontoons as a high weight capacity pier for equipment repair, net mending, etc. The pontoon used in the east breakwater is the "F" pontoon. It is 350 feet long, 59 feet wide, and 16 feet high. The pontoon has a draft of between 7.00 feet and 7.33 feet, and displaces approximately 5,000 tons. Construction of the east breakwater would begin by regrading and compacting the existing groundline to create a pad at a elevation of 0.00 ft (MLLW). The pontoon would be floated onto the pad on a high tide (8.3-foot-tide or higher), then approximately 14,000 cubic yards of sand dredged from the marina site would be placed in the pontoon to prevent it from refloating on subsequent high tides. Quarry spalls would be placed to form a 3-foot-thick blanket around the base of the pontoon to prevent the sand foundation from being eroded from the edges of the pontoon. The east side of the pontoon would be protected from wave attack by a rock revetment. The Corps of Engineers numerical model NMLONG was used to determine the combined effects of shoaling and refraction on waves approaching the east side of the pontoon. The design wave height was determined to be 6.4 feet. However, to simplify construction, the east breakwater uses the same armor stone gradation used for the north breakwater where the design wave is slightly higher (H_i = 7.5 feet). The top elevation of the rock along the face of the pontoon would be +10 ft MLLW and the top width of revetment would be 10 feet. A sand fill, with a 1V on 5H slope, would be placed along the inner side of the pontoon to cover the quarry spalls and minimize the potential for providing habitat for fish that prey on migrating salmon. The completed east breakwater would have a top elevation of +16 ft MLLW. Wave run up calculations indicate a maximum run up elevation of approximately +20 ft MLLW can be expected if the design wave occurs during high tide conditions. Therefore, when waves and high tides occur simultaneously, a significant amount of overtopping can be expected. Because of the 59-foot-wide top width of the pontoon, the overtopping water will enter the marina as sheet flow, and should not cause scour or generate waves inside the basin. Construction of the east (pontoon) breakwater would cost approximately $180,000.

2.04 Effects on Adjacent Shorelines. The east breakwater of the proposed marina would act as a groin and intercept any sediment that is being transported westward along the southern shoreline of Neah Bay. The area east of the breakwater would slowly fill with sand and, eventually, the shoreline would probably appear similar to the existing shoreline immediately east of Evans mole. Most of the remainder of the southern shoreline would lie in the shadow of the proposed breakwater, halting any westward longshore transport that may be occurring at this time. Since the western shore of Neah Bay does not appear to have a longshore transport in either direction, the proposed marina should have no effect on this portion of the shoreline.

2.05 Effects on Water Circulation. Many of the major features of the marina would be advantageous to good tidal flushing. Unlike most marinas that have one or possibly two narrow entrances, the proposed marina basin would be enclosed only on three sides, being completely open on the west side. In addition, approximately 30% of the area enclosed by the breakwaters would remain intertidal. Drainage off this shallow peripheral area combined with flow through the fish passage significantly reduces the potential of any circulation "dead spots." The proposed basin has a tidal prism ratio (TPR) of 0.26 for a tide range of 5.5 feet (MLW to MHW), and a TPR of .36 for the diurnal range of 7.9 feet (MLLW to MHHW). (The TPR is defined as the ratio: $(V_{HW} - V_{LW})/V_{HW}$, where V_{HW} = basin volume at high water, and V_{LW} = basin volume at low water. This TPR is comparable to that of other existing boat basins that have been constructed, and even if the proposed marina were enclosed with a single narrow entrance, its flushing efficiency probably would be similar to that of existing marinas. Because the open west side of the basin is over 1,000 feet wide, tidal flow into and out of the marina is essentially unimpeded, and the Neah Bay design probably is more comparable to projects utilizing floating breakwaters such as Friday Harbor. For this reason, water quality within the marina is not expected to differ significantly from ambient water outside the marina. The feasibility of conducting a model study to assist in optimizing the marina layout for water circulation was considered and rejected To get even marginally useful information, a 3-dimensional numerical model or a physical model would have been required at a cost of $100,000 to $200,000. Rather than "study the problem," a decision was made to incorporate the major changes that would result in obvious improvements in water circulation. The basin was moved seaward and realigned to maximize both the marina entrance width and the intertidal area inside the marina. In addition, a second opening was included at the east end of the marina to allow for the passage of migrating juvinile salmon and to assure that water would circulate to the most interior portions of the marina.

2.06 Dredging and Disposal. Construction of the authorized project would require dredging approximately 50,000 cubic yards of material, (including 1 foot of contractor over depth). Dredging would be by hydraulic dredge. Approximately 14,000 cy would be necessary for ballasting the pontoon. A mitigation measure to place a sand blanket over the quarry spalls on the marina side of the pontoon would require approximately 1,000 cy. Another mitigation measure to assist in stabilizing the beach on the east side of the breakwater would require the placement of approximately 5,000 cy adjacent to the east side of the pontoon. The remaining 30,000 cy of dredged material would be available for mitigation purposes.

2.07 Operation and Maintenance.

a. Maintenance Dredging. Since the Federal entrance channel is below project depth, no dredging is anticipated during the 50-year project life. Likewise, non-Federal maintenance dredging is expected to be minor. The proposed breakwaters are expected to effectively block sediment being transported in a westerly direction along the south shore of Neah Bay. A minor amount of material may be transported eastward into the marina from the area west of the proposed project where the shoreline would be protected from westerly waves by the new breakwaters but would remain exposed to easterly waves.

b. Maintenance of Breakwaters. Breakwater maintenance is expected to include replacement of 25% of the north breakwater armor stone (8,000 tons) at year 25. The east breakwater will require only minor maintenance in the 50-year project life. Federal breakwater maintenance costs are shown in table D-4.

c. Maintenance of Fish Passage Area. As part of the mitigation for this project, a passageway between the east and north breakwaters is provided for juvenile salmon that are migrating along the south shore of Neah Bay. Immediately after construction of the breakwaters, the elevation in the passage would be between 0 ft MLLW and -2 ft MLLW. Sand, carried westward by littoral processes, may be deposited in the passage, and if not removed, eventually block the passage. Based on the rate at which material was trapped by Evans mole after its construction in 1965, the rate of deposition is expected to be no more than 1,000 cy in 5 years. The sand would have to be excavated at low tide (or dredged by clamshell from the east breakwater) and placed in an updrift location between the marina and the present location of Evans mole. Maintenance of the fish passage opening is a Federal responsibility. (Assumption of this maintenance responsibility is being considered by the local sponsor in conjunction with non-Federal moorage basin maintenance dredging, with appropriate cost sharing credit.)

d. Monitoring of Evans Mole Mitigation Area. The beach profile changes and productivity will be monitored at years 3, 5, 8, and 10 and conclusions reported to the appropriate environmental agencies. No mitigation maintenance would be needed and none will be attemted.

e. Maintenance of Marina Facilities and Pontoon Dock. Non-Federal responsibility would include maintenance of all moorage floats, access docks, fuel docks, wharfs, access ramps, and boat launch ramp; access roads; marina parking; shore side facilities; and other marina support facilities. Maintenance of the pontoon and access bridge for purposes of using the deck as a work area is entirely a non-Federal responsibility. The estimated non-Federal costs for maintenance are shown on table D-6.

SECTION 3. COST ESTIMATE AND SCHEDULE

3.01 Project Cost Estimate. Table D-2 contains a summary of total project first costs. A detailed breakdown of first costs and maintenance costs for the Federal project is shown on tables D-3 and D-4. Tables D-5 and D-6 show the estimated non-Federal first costs of construction and maintenance costs of the associated marina facilities. Project costs are based on October 1993 prices. Tables D-3 and D-5 are estimated costs of constructing the features listed before applying cost sharing requirements. See section 4.19 and table 4-6 of the main report for Federal and non-Federal cost sharing figures.

3.04 Design and Construction Schedule. The design and construction schedule of Federal project features plus dredging of the moorage basin is shown below. The schedule assumes project authorization and adequate Congressional funding. See plate 5 for a more detailed presentation of the schedule. The construction period would extend from January 1 through March 14, 1995, and from June 16, 1995 through March 14, 1996.

Submit Final Report to Division office	Jan 1994
Washington, D.C., Corps Review	Feb 1994
Initiate Plans and Specifications	Feb 1994
Request Project Approval	Jun 1994
Sign Project Cooperation Agreement	Sep 1994
Local Sponsor Certifies Land Available	Sep 1994
Advertise Construction	Oct 1994
Award Contract	Dec 1994
Notice to Proceed	Jan 1995
Place, Fill Pontoon, Begin Haulroad	Jan 1995
Fisheries Closure to In-Water Activities:	Mar 15 - Jun 15, 1995
Manufacture rock at quarry	
Resume In-Water Activities:	
Place Rock for North Breakwater	Jun 16, 1995
Dredging & Moorage Facilities	Oct 1995
Breakwater & Marina Facilities Complete	Mar 1996

TABLE D-1
ESTIMATED PROJECT ACREAGE

	Project Area	Estimated Acreage
1.	Federal Entrance Channel	1.8
2.	Moorage Basin (dredged area)	5.0
3.	Moorage Basin (undredged area)	12.2
4.	Moorage Basin (undisturbed peripheral area)	10.7
5.	North Breakwater Footprint	4.4
6.	East Breakwater Footprint	0.5
7.	Marina Upland Parking	1.0
8.	Temporary Dredging Disposal Area	2.6
9.	Tidal Mitigation Area	8.0
10.	Evans Mole	0.5

TOTAL - ALL CONTRACTS

TOTAL PROJECT COST SUMMARY

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT DPR, NOVEMBER 1993

PROJECT: NEAH BAY MARINA EXPANSION
LOCATION: NEAH BAY, WASHINGTON

DISTRICT: SEATTLE
POC: GENE GRIEVE, CHIEF, COST ENGINEERING

ACCOUNT NUMBER	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREP: NOV 1993 EFFECTIVE PRICING LEVEL: OCTOBER 1993 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZED/BUDGET YE EFFECTIVE PRICING LE COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED EST. COST ($K)	CNTG ($K)	FULL ($K)
06	FISH AND WILDLIFE FACILITIES	10	2	20%	12				11	2	13
10	BREAKWATERS AND SEAWALLS	3,102	466	15%	3,568				3,313	498	3,811
12	NAVIGATION, PORTS AND HARBORS	2,626	484	18%	3,110				2,805	517	3,322
	TOTAL CONSTRUCTION COST	5,738	952	17%	6,690				6,129	1,017	7,146
01	LANDS AND DAMAGES	54	3	5%	57				58	3	61
30	PLANNING, ENGINEERING AND DESIGN	415	45	11%	460				446	48	494
31	CONSTRUCTION MANAGEMENT	395	45	11%	440				435	50	485
	AIDS TO NAVIGATION	4	0	0%	4				4	0	4
	TOTAL PROJECT COSTS	6,606	1,045	16%	7,651				7,072	1,118	8,190

TOTAL FEDERAL COSTS $3,475

TOTAL NON-FEDERAL COSTS $4,715

THE MAXIMUM PROJECT COST IS $8,190

THIS TPCS REFLECTS A PROJECT COST CHANGE OF $ _____

DISTRICT APPROVED:

_____ CHIEF, COST ENGINEERING

_____ CHIEF, REAL ESTATE

_____ CHIEF, PLANNING

_____ CHIEF, ENGINEERING

_____ CHIEF, CONSTRUCTION

_____ CHIEF, OPERATIONS

_____ CHIEF, PROGRAMS MANAGEMENT

_____ PROJECT MANAGER

_____ DDE (PM)

DIVISION APPROVED:

_____ CHIEF, COST ENGINEERING

_____ DIRECTOR, REAL ESTATE

_____ CHIEF, PROGAMS MANAGEMENT

_____ DIRECTOR OF PPMD

APPROVED DATE: _____

FEDERAL PROJECT FIRST COSTS

**** TOTAL CONTRACT COST SUMMARY ****

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT DPR, NOVEMBER 1993

PROJECT: NEAH BAY MARINA EXPANSION
LOCATION: NEAH BAY, WASHINGTON

DISTRICT: SEATTLE
POC: GENE GRIEVE, CHIEF, COST ENGINEERING

ACCOUNT NUMBER	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREP: NOV 1993 EFFECTIVE PRICING LEVEL: OCTOBER 1993 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZED/BUDGET YE EFFECTIVE PRICING LE COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED EST. COST ($K)	CNTG ($K)	FULL ($K)
06	FISH AND WILDLIFE FACILITIES	10	2	20%	12				11	2	13
10	BREAKWATERS AND SEAWALLS	3,102	466	15%	3,568				3,313	498	3,811
	TOTAL CONSTRUCTION COST	$3,112	$468	15%	$3,580				$3,324	$500	$3,824
01	LANDS AND DAMAGES	54	3	6%	57				58	3	61
30	PLANNING, ENGINEERING AND DESIGN	135	15	11%	150				145	16	161
31	CONSTRUCTION MANAGEMENT	225	25	11%	250				248	28	276
	AIDS TO NAVIGATION	4	0	0%	4				4	0	4
	TOTAL PROJECT COSTS	$3,530	$511	14%	$4,041				$3,779	$547	$4,326

TABLE D-2 (cont.)

NON-FEDERAL PROJECT FIRST COSTS **** TOTAL CONTRACT COST SUMMARY ****

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE DRAFT DPR, NOVEMBER 1993

PROJECT: NEAH BAY MARINA EXPANSION
LOCATION: NEAH BAY, WASHINGTON

DISTRICT: SEATTLE
POC: GENE GRIEVE, CHIEF, COST ENGINEERING

ACCOUNT NUMBER	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREP: NOV 1993 EFFECTIVE PRICING LEVEL: OCTOBER 1993 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZED/BUDGET YE EFFECTIVE PRICING LE COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED EST. COST ($K)	CNTG ($K)	FULL ($K)
12	NAVIGATION, PORTS AND HARBORS	2,626	484	18%	3,110				2,805	517	3,322
	TOTAL CONSTRUCTION COST	$2,626	$484	18%	$3,110				$2,805	$517	$3,322
30	PLANNING, ENGINEERING AND DESIGN	280	30	11%	310				301	32	333
31	CONSTRUCTION MANAGEMENT	170	20	12%	190				187	22	209
	TOTAL PROJECT COSTS	$3,076	$534	17%	$3,610				$3,293	$571	$3,864

TABLE D-2 (cont.)

TABLE D-3

DETAILED FEDERAL FIRST COSTS - GENERAL NAVIGATION FACILITIES
(October 1993 Price level)

Feature or Item	Unit	Quantity	Unit Price	Amount
1. North Breakwater Construction				
a.Mob and Demob	Job	1	L.S.	$19,880
b.Place haul road 1/	cy	2500	$15.84	39,600
c.Quarry spalls 2/	cy	161000	$15.84	2,550,240
d.Armor rock 2/	cy	20500	$15.84	324,720
e.Remove haul road	cy	2500	$4.00	10,000
Subtotal				$2,944,440
2. East Breakwater Construction				
a.Grade pontoon berth	cy	3500	$2.00	$7,000
b.Guide piles (24 @45' ea.)	lf	1080	$14.00	$15,120
c.59'X 350'X 16' pontoon	ea.	1	L.S.	$50,000
d.Pontoon preparation	Job	1	L.S.	$20,000
e.Pontoon placement	Job	1	L.S.	$10,000
f.Quarry spalls 2/	cy	2000	$15.84	$31,680
f.Armor rock 2/	cy	1500	$15.84	$23,760
Subtotal				$157,560
3. Mitigation Features				
a.Sand on W. of pontoon	cy	1000	$2.00	$2,000
b.Remove rock @ Evan's mole	tons	2000	$4.00	$8,000
Subtotal				$10,000
Construction Cost (items 1 - 3)				$3,112,000
Contingencies (15%)				$468,000
Total Construction Cost				$3,580,000
4. Engineering & Design (4 % of total const. cost)				$150,000
5. Supervision & Inspection (7 % of total const. cost)				$250,000
6. Lands and Damages 3/				$57,000
Subtotal - Corps of Engineers First Cost				$4,037,000
7. U.S. Coast Guard Aids to Navigation				$4,000
TOTAL FEDERAL FIRST COST - General Navigation Facilities				$4,041,000

1/ Assumes pontoon is used as part of haul road.
2/ Unit price does not include royalty or material costs.
3/ Includes $45,650 land value, $6,000 Fed & Non-Fed LERRD activities, and 10 % contingency.

TABLE D-4

DETAILED FEDERAL MAINTENANCE COSTS - GENERAL NAVIGATION FACILITIES
(October 1993 Price level)

Feature or Item	Unit	Quantity	Unit Price	Amount	Average Annual Cost 1/
1. North Breakwater (@ yr. 25)					
a.Mob and Demob	Job	1	L.S.	$50,000	
b.Armor rock (replace 25%)	cy	5125	$32.00	164,000	
			Subtotal	$214,000	$2,500
2. East Breakwater (@ yr. 25)					
a.Pontoon repair	Job	1	L.S.	$10,000	
b.Armor rock (replace 15%)	cy	225	$15.84	3,564	
			Subtotal	$13,564	$200
3. Mitigation Features (Every 5 yrs)					
a.Remove sand between E & N bw	cy	1000	$2.00	$2,000	
b.Chemical Sediment Testing				3,000	
			Subtotal	$5,000	$800
4. Monitor Mitigation Beach					
a.Photo/site inspection, coord (Yrs 3, 5, 8, 10)	Job	1	L.S.	$2,000	$400
b.Clam reconnaissance survey (Year 5)	Job	1	L.S.	$5,000	$300
			Subtotal		$4,200
Contingencies (15%)					600
			Subtotal		$4,800
Engineering & Design (10%)					500
Supervision & Inspection (8%)					400
TOTAL ESTIMATED ANNUAL COST					$5,700
				Rounded	$6,000

1/ 50-year project life, 8-1/4 percent interest rate.

TABLE D-5

DETAILED NON-FEDERAL FIRST COSTS - ASSOCIATED MARINA FACILITIES
(October 1993 Price level)

Feature or Item	Unit	Quantity	Unit Price	Amount
1. Dredging and Disposal (moorage basin)	cy	50000	$4.00	$200,000
Subtotal				$200,000
2. Mitigation Features				
a.Regrade sand E. of pontoon	cy	5000	$2.00	$10,000
b.Regrade sand to mit. site	cy	30000	$2.00	60,000
Subtotal				$70,000
3. Moorage Facilities				
a.Access Pier	sf	9700	$20.00	$194,000
b.Concrete Floats	sf	40720	$28.00	1,140,160
c.Moorage Float Pilings	ea	180	$1,050	189,000
d.Utilities	Job	1	L.S.	141,840
e.Access Ramps	ea	5	$16,000	80,000
Subtotal				$1,745,000
4. East Breakwater Modification				
a.Prepare Work Surface	sf	3000	$15.00	$45,000
b.Utilities	Job	1	L.S.	242,000
c.Access Road	ea	1	L.S.	85,000
Subtotal				$372,000
5. Overhead & Profit (10.0 %)				$239,000
Subtotal				$2,626,000
Contingencies (18%)				484,000
Total Construction Cost				$3,110,000
6. Engineering & Design				$310,000
7. Supervision & Inspection (6.0 %)				$190,000
TOTAL NON-FEDERAL FIRST COST				$3,610,000

TABLE D-6

DETAILED NON-FEDERAL MAINTENANCE COSTS - ASSOCIATED MARINA FACILITIES
(October 1993 Price level)

Feature or Item	Unit	Quantity	Unit Price	Amount	Average Annual Cost 1/
1. Maintenance Dredging (Every 5 yrs)					
(moorage basin)	cy	5000	$6.00	$30,000	
Subtotal				$30,000	$5,000
2. Moorage Facilities Annual Repair					
a.Access Pier	sf	194	$20.00	3,880	
b.Concrete Floats	sf	407	$28.00	11,396	
c.Moorage Float Pilings	ea	4	$1,050	4,200	
d.Utilities	Job	1	L.S.	2,824	
e.Access Ramps	ea	0.1	$16,000	1,600	
Subtotal				$23,900	$23,900
3. East Breakwater Annual Repair					
a.Work Surface	sf	60	$15.00	$900	
b.Utilities	Job	1	L.S.	4,800	
c.Access Road	Job	1	L.S.	1,700	
Subtotal				$7,400	$7,400
4. Overhead & Profit (10.0 %)					$3,600
Subtotal					$39,900
Contingencies (20%)					$8,100
Total Construction Cost					$48,000
5. Engineering & Design					$10,000
6. Supervision & Inspection (6.0 %)					$3,000
7. Average Annual DNR Lease Rental					$8,000
TOTAL NON-FEDERAL ANNUAL COST					$69,000

1/ 50-year project life, 8-1/4 percent interest rate.

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM AVENUE
TROUTDALE, OREGON 97060-9500

CENPD-PE-GT-L (1110-1-8100c) 30 June 93

MEMORANDUM FOR Commander, Seattle District, ATTN: CENPS-EN-DB-CD (Kato)

SUBJECT: W.O.#93-650, Report of Soil Analysis

Project: NEAH BAY MARINA
Source of Material: Neah Bay, Washington
Submitted by: CENPS-EN-DB-CD (Kato)
Date Sampled: --- Date Received: 15 June 1993
Method of Test or Specification: ASTM, EM1110-2-1906
Reference: DD Form 448, MIPR no. E86-93-3142 dated 21 June 1993

1. Enclosed is report of particle size analysis and gradation tests for 3 samples submitted from the above project. Included are enclosures 1 through 3, Report of particle size analysis and classification tests, one for each sample submitted.

2. Summary of Water Content and Soil Classification Results are as follows:

Sample Location	Sample No.	Depth	Water Content, %	Classification ASTM D-2487	Classification TM5-818-2
93-VC-2	1	0.0-1.0'	18.2	SP	NFS
93-VC-5	3	3.0-3.7'	17.8	SM	S2
93-VC-2	4	8.0-9.0'	16.2	SP	NFS

CENPD lab no. 4697, samples received 15 June, 1993.

3. This completes all physical testing requested for this project.

Timothy J. Seeman

TIMOTHY J. SEEMAN
Director

Enclosures

Copy Furnished: CENPD-PE-GT

* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

NEAH BAY MARINA (93-650)

Boring: 93-VC-2 Sample: 1 Depth: 0.0-1.0' Lab No.: 65001

----- Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	24.20	97.9
3/4 In.	24.20	97.9
1/2 In.	45.40	96.1
3/8 In.	59.50	94.9
No. 4	71.90	93.8
No. 10	82.70	92.9
Pan	1160.50	0.0
No. 16	1.36	90.7
No. 30	6.79	82.2
No. 50	14.98	69.3
No. 100	49.83	14.4
No. 200	57.02	3.1
Pan	59.00	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 59. gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	1.3	0.0537	2.8
3	20.0	1.3	0.0310	2.8
10	20.0	1.3	0.0170	2.8
100	20.0	0.5	0.0070	1.6
200	20.0	0.5	0.0049	1.6

D85: 0.71 D60: 0.26 D50: 0.23 D30: 0.18 D15: 0.15 D10: 0.11 mm

Cu: 2.33 Cc: 1.10

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

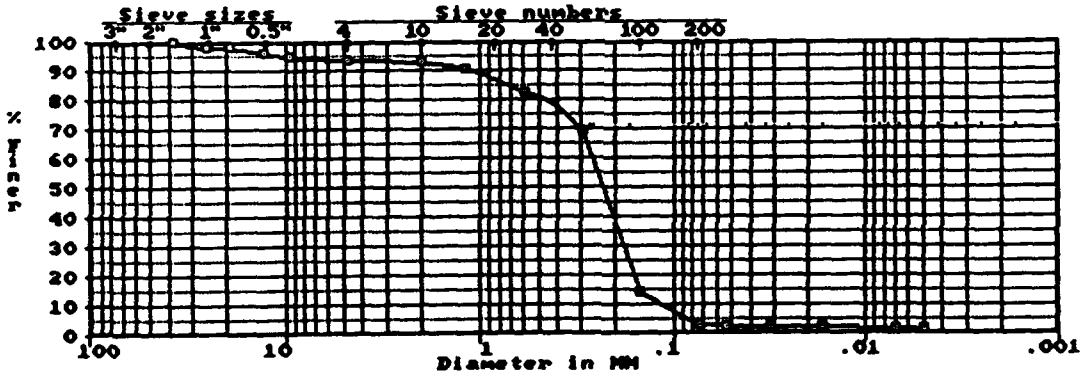
Gravel: 6.2% Sand: 90.7% Fines: 3.1%

---------- ASTM D 2487 Classification ----------

SP Poorly graded SAND

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 2.8 Frost Classification: NFS



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

NEAH BAY MARINA (93-650)

Boring: 93-VC-05 Sample: 3 Depth: 3.0-3.7' Lab No.: 65003

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	82.00	95.0
1 In.	82.00	95.0
3/4 In.	152.60	90.8
1/2 In.	233.20	85.9
3/8 In.	272.80	83.5
No. 4	351.60	78.8
No. 10	425.60	74.3
Pan	1654.60	0.0
No. 16	0.64	73.5
No. 30	1.53	72.4
No. 50	1.62	72.3
No. 100	28.43	38.8
No. 200	46.76	16.0
Pan	59.60	0.0

Hydrometer Analysis

Sample Weight: 59.6 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	4.8	0.0528	6.5
3	20.0	3.8	0.0306	5.3
10	20.0	2.8	0.0169	4.1
100	20.0	2.0	0.0069	3.1
200	20.0	1.0	0.0049	1.9

D85: 11.5 D60: 0.22 D50: 0.18 D30: 0.12 D15: .072 D10: .061 mm

Cu: 3.69 Cc: 1.00

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

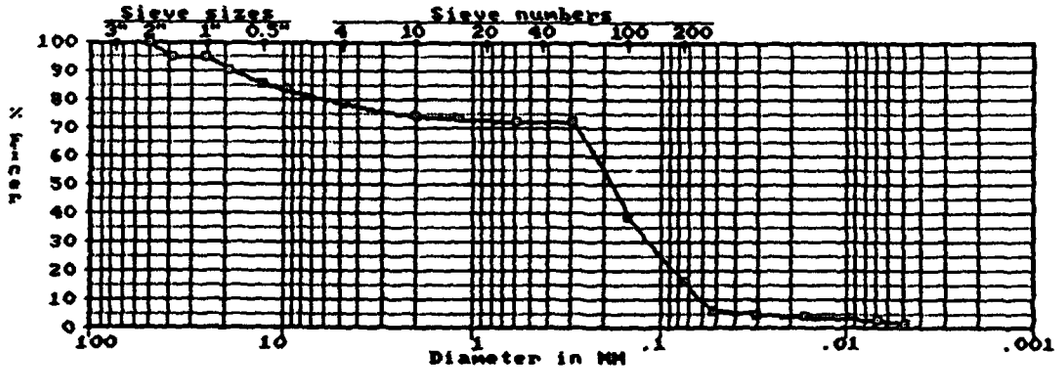
Gravel: 21.2% Sand: 62.8% Fines: 16.0%

ASTM D 2487 Classification

SM Silty SAND with gravel

TM 5-818-2 Frost Classification

Percent finer than 0.02 mm: 4.4 Frost Classification: S2



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

NEAH BAY MARINA (93-650)

Boring: 93-VC-2 Sample: 4 Depth: 8.0-9.0' Lab No.: 65002

----- Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	147.80	92.1
3/4 In.	147.80	92.1
1/2 In.	147.80	92.1
3/8 In.	155.20	91.7
No. 4	169.20	91.0
No. 10	188.60	90.0
Pan	1877.60	0.0
No. 16	1.27	88.1
No. 30	5.68	81.6
No. 50	17.68	63.9
No. 100	54.25	10.0
No. 200	59.07	2.8
Pan	61.00	0.0

---------- Hydrometer Analysis ----------

Sample Weight:61. gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	1.3	0.0537	2.6
3	20.0	1.3	0.0310	2.6
10	20.0	1.3	0.0170	2.6
100	20.0	0.5	0.0070	1.5
200	20.0	0.5	0.0049	1.5

D85: 0.77 D60: 0.28 D50: 0.25 D30: 0.19 D15: 0.16 D10: 0.15 mm

Cu: 1.90 Cc: 0.89

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 9.0% Sand: 88.2% Fines: 2.8%

---------- ASTM D 2487 Classification ----------

SP Poorly graded SAND

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 2.6 Frost Classification: NFS